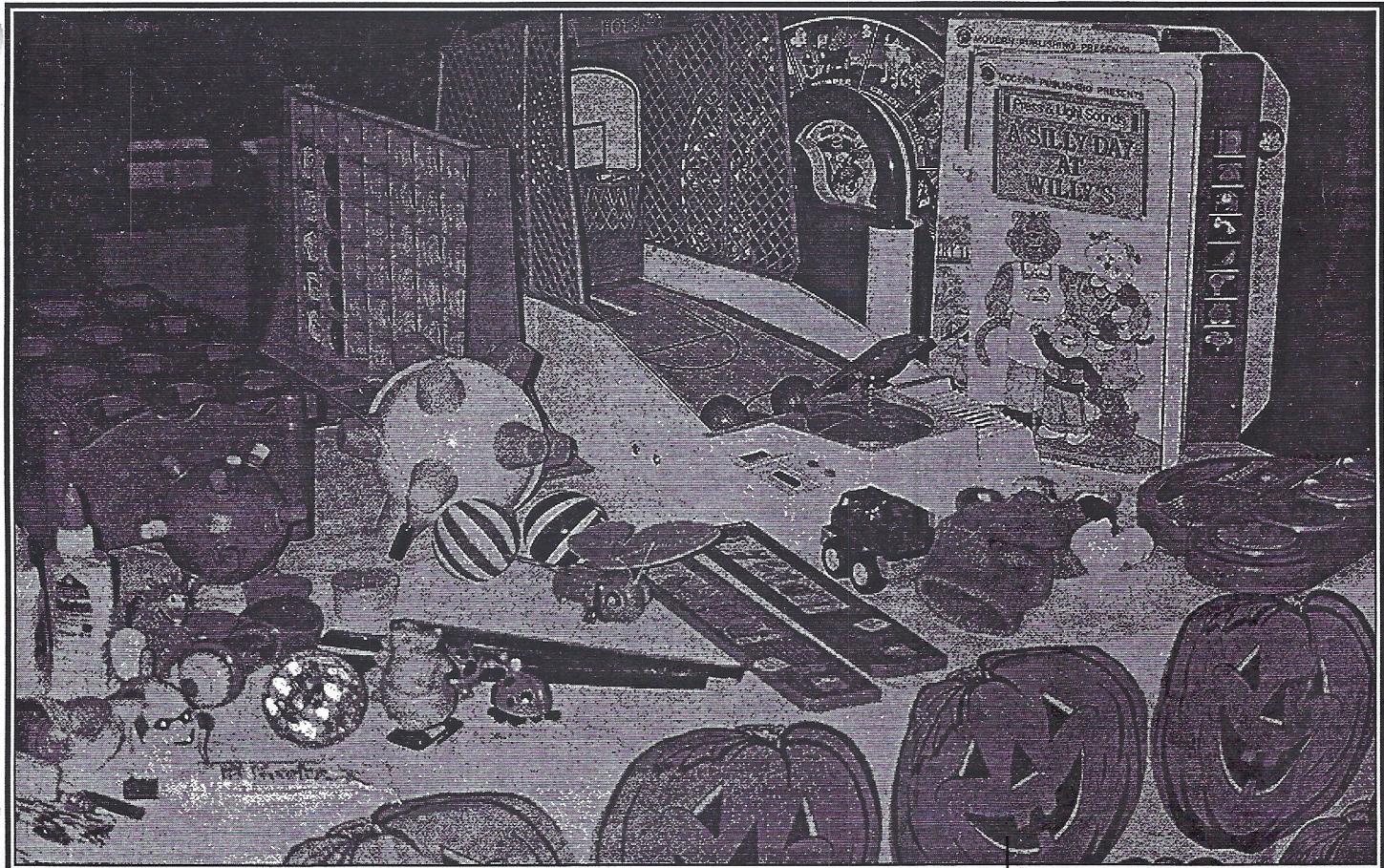
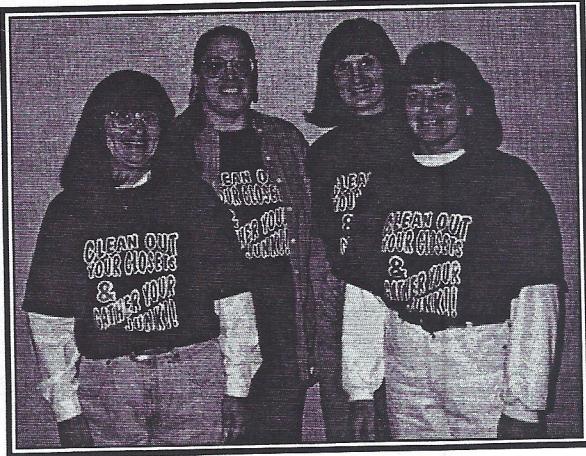


Good Junk + Creativity = Great Low-End Technology!

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The Four Weird Women



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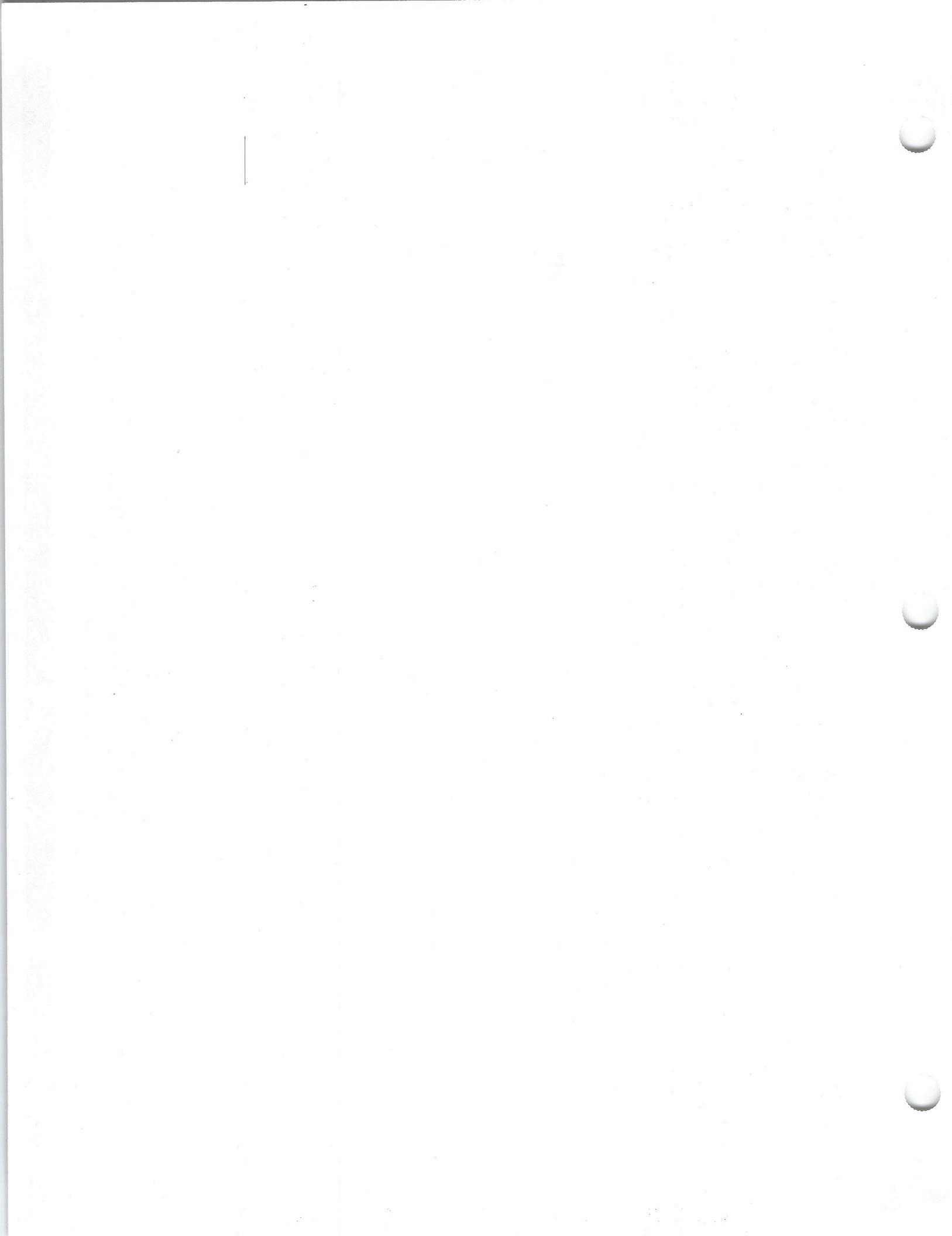
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Introduction

Technology is a real key to making education more inclusive for children and adolescents with disabilities. Frequently, the focus of technology for students with disabilities is on moderate to high-end equipment, software, and devices. When the focus remains at this level, budgetary constraints (real or imagined) seem to loom as the decision-making factor determining whether a student has access to technology, or technology is viewed as something that would "be nice" for the student, but "we can't afford it." It is at this point where the arena of low-end technology (teacher-, therapist-, peer-, or family-designed and -created) may serve as an effective means to an end. The "end" is defined as accommodation and inclusion in the classroom, home, and community.

The federal definition of "Assistive Technology" is quite broad and flexible and encompasses the entire spectrum of technology, from low- to high-end:

Assistive Technology is any item, piece of equipment or product or system, whether acquired commercially off the shelf, modified or customized that is used to increase, maintain or improve the functional capabilities of individuals with disabilities.

(IDEA, Section 101(g), 1990)

The focus of the federal definition clearly parallels the primary goals of special education, habilitation, and therapeutic interventions in terms of increasing, maintaining, and improving the skills and abilities of persons with disabilities. While high-end technology (i.e., electronic communication systems, environmental control systems, powered mobility, etc.) may be the end goal for a particular individual, the road to accomplishing that goal may well include the design and development of low-end technology "access bridges" along the way. Whether these "bridges" serve an evaluative function in terms of determining what characteristics and features are appropriate and salient for an individual user, or whether the "bridge" is used as an "in-between" measure until the more sophisticated technology arrives, the role of low-end technology in the arena of assistive technology is critical and can facilitate and support the full participation of an individual in daily life tasks and activities.

Low-end technology can also be a significantly powerful tool for inclusion. Low-end technology often facilitates inclusion experiences because it is less threatening and less overwhelming than more high-tech approaches. A working definition of low-end technology includes simple modification/adaptation of toys and games; the design and construction of simple switching devices; and the adaptation/modification of academic tasks and activities that supports and enhances a student's participation in classroom, community, and daily life activities. Low-end technology usually involves creating devices from "great junk" and "leftover parts," and includes creative "new" uses for "old" technology. It also involves innovative approaches and strategies for utilizing the technology available in school, home, and community settings, as well as the development of "low-budget or no-budget" low-end technology applications which support and facilitate the full inclusion of children and adolescents with disabilities.

Inclusion, in its broadest description, is supported by low-end technology design and creation permitting teachers, therapists, peers, and families to become creators of low-end technology devices, materials, and applications. The creative "power" that emerges when teachers, therapists, peers, and family members are faced with a collective accommodation/adaptation situation, and provided with an array of "good junk and old parts," consistently results in the design and creation of unique and effective adaptive/assistive devices, strategies, and techniques.

The user's peers may be the most creative and available resource in the design of low-end technology devices. No matter what age, peers are able to perceive what the user needs to access the social climate of the classroom and community. They are also reliable indicators of

Supplies for Communication and Choice Making

1. Communication pictures and symbols
2. *Velcro*™
3. Small objects or toys
4. Photos of toys, objects, locations, people, etc.
5. Baseball card album sheets
6. Photo album sheets
7. Slide storage sheets
8. *POG*™ storage sheets or Coin Collector sheets
9. Foam letters and numerals
10. Scotch tape
11. Rubber cement
12. Tag board and construction paper
13. File folders and three ring notebooks
14. Clear contact paper or access to a laminating machine
15. Colored glue or puff paint (*Ross Colored Playtime Glue*™ works well and is less expensive than other brands or puff paint – it's also washable)

Once "good junk," tools, and supplies have been gathered, the designing, creating, and developing of exciting low-end technology can begin! Talk to the user, the user's peers, family, and friends to gather creative ideas and suggestions, then consider the following topical areas for low-end technology usage:

1. Communication and choice-making
2. Developmental activities
3. Daily lesson/activity modifications that promote active learning
4. Peer/social interaction
5. Toy construction/modification
6. Single switch design/construction
7. Daily living activities and leisure/recreation access
8. Community interaction and access
9. Computer access
10. Promoting independence

Remember that Low-end Technology permits the trial of creative accommodations to address sensory and motor needs. The following thoughts should be kept in mind:

- When adapting materials consider the user's visual abilities, the user's unique characteristics, and the environmental cues.
- Make sure that the adaptation provides a realistic balance between what is possible and what is practical.
- Only adapt materials when necessary. Do not assume objects, games, or materials need to be adapted until the user has tried them.
- Whenever possible encourage the user to assist with the planning and "brainstorming" of adaptations. The user often knows what may work and what definitely will not work.
- When planning modification or adaptation of materials make sure the adaptations or modifications will be visually appealing and not call unnecessary attention to the user.
- Above all, remember that the adaptations are temporary, and check periodically to determine if any changes should be made.

what is socially acceptable and unacceptable within peer groups and can provide valuable insight relative to acceptance or rejection of low-end technology devices. Nondisabled peers represent a potentially powerful, creative, and enthusiastic resource for the development and enhancement of adaptive/assistive technologies for their peers with disabilities.

Peers are an important component in the social/emotional development of every child and adolescent. Therefore, it should be no surprise that students with disabilities are more likely to interact with and actively use devices and applications that were created by their peers. More importantly, activities and experiences that place nondisabled peers in the role of problem-solvers appear to foster increased acceptance of, and support for, peers with disabilities. Low-end technology devices and strategies are frequently more accepted by the user with disabilities when his/her peers are accepting of the device and had a part in its creation. Therefore, when nondisabled peers are provided the freedom, support, and direct experiences with adaptive and assistive technology, peers with disabilities become friends and equals.

Matching Low-End Technology Design with a User's Needs

When designing and creating low-end technology devices, consideration needs to be given to the whole user. While the user's strengths and needs are important factors, the user's likes and dislikes, reactions to various stimuli, and what truly interests or "turns on" the user also needs to be considered. The questions, "What does the user want to be able to do?" and "Will this low-end technology device support the user in acquiring new skills and greater independence," need to be asked.

In her book, *Low Vision: A Resource Guide with Adaptations for Students with Visual Impairments*, Nancy Levack proposes seven variables which should be considered when planning adaptations for persons with visual impairments. The considerations that Levack proposes are appropriate to the design of low-end technology (and other types of technology) for all individuals with disabilities and provide a template for low-end technology design and construction:

1. When making decisions about adaptations, three areas must be considered. They include the student's visual abilities (acuity, visual fields, motility, brain functions, light and color reception), the stored and available individuality of the student (cognition, sensory developmental integration, perception, psychological makeup, physical makeup), and environmental cues (color, contrast, time, space, illumination). (CORN & MARTINEZ, 1976)
2. Weigh the extent that the adaptation calls attention to the student and limits their performance of the task when the adaptation is not available, against the independence that they experience when using the adaptation.
3. Develop a realistic balance between what's possible and what is practical. Compromises may need to be made.
4. Sometimes it is most efficient to use a combination of environmental adaptations (adjusting lighting, highlighting or marking objects to be seen) and personal accommodation on the part of the student (moving closer, using a low vision device, wearing a visor to shade eyes from glare).
5. When possible, help the students to identify their own visual limitations while encouraging maximum visual efficiency by problem-solving what kinds of adaptations might help.
6. Be alert for signs of frustration and fatigue which can signal the upper limits of visual functioning.
7. When these visual limits have been reached, problem-solve alternative methods or adaptations which can ease the visual task.

(LEVACK, 1991, P. 96)

Although the language of these recommendations focuses on vision, one can substitute the term "physical," "cognitive," "motoric," or "auditory" for the term "vision," and the recommen-

dations support critical user characteristics in technology design, irrespective of disability type. For example, it is just as important to consider issues of user fatigue, or environment, or a user's personal accommodation strategies for a user with physical disabilities as it is for a user with visual disabilities.

It is also important to consider the user's functional vision skills when planning for accommodations using low-end technology. Functional vision refers to how the individual uses his/her vision in a functional manner. Simply knowing the user's visual acuity will not determine how the user employs vision in a functional manner.

When the user's visual skills are in question, a Functional Vision Assessment should be conducted. It is important to note that a Functional Vision Assessment should not take the place of a vision exam by an optometrist or ophthalmologist. The Functional Vision Assessment, conducted by the vision consultant or vision specialist, should augment the vision exam conducted by a doctor. If there is no vision consultant in your area, contact the occupational therapist who may be able to assist in performing a Functional Vision Assessment.

The results of a Functional Vision Assessment should indicate how the user's vision will affect his/her everyday performance. Such things as eye deviations, eye preference, best visual field, and the use of both eyes together are important outcomes of assessment. Other factors such as length of fixation, tracking skills, scanning and accommodation skills have direct impact on the types of accommodations that are appropriate for the user, as well as the positioning of communication devices, single switches, or other general low-end technology.

Perhaps the single most important consideration to keep in mind in the design and development of low-end technology is that the adaptation/accommodation you design is temporary. The design of low-end technology for any user is an ongoing endeavor, with the constant need to evaluate the impact of the technology, the user's mastery of the device or strategy, and the user's need for a more sophisticated and challenging approach. In other words, what is initially designed and developed for a user should represent the first step of a development process or a prototype of a device or strategy that can be enhanced and modified across time, based on the user's needs.

The "beauty" of low-end technology is that, since it is low-cost or no-cost, constructed from "good junk" and "leftover parts," it can be modified, changed, and recreated as the user's skills and needs become more and more refined. In other words, low-end technology permits "playing" with designs and strategies, gathering input from the user and others, until the device or strategy truly meets the user's needs. From this point more sophisticated (and costly!) levels of technology can be investigated to address the user's needs on a more permanent basis.

Getting Started on a Low-End Technology Adventure!

Once you've considered issues critical to the user, you're ready to gather your "good junk, stuff and parts" and let your creativity run wild! The best way to prepare for the design and creation of low-end technology is to locate a wide array of "good junk" and "leftover parts." You may also want to take a trip to your local "dollar" store, salvage stores, your neighbor's garage, your basement, junk drawers or closets, or any other location where good "stuff" is available for free or for extremely low-cost. It's also a good idea to gather basic tools and supplies. A recommended list of tools and supplies is included in the following section.

Basic Tools and Supplies

1. A good pair of scissors (We recommend the *Fiskars™* brand — they'll cut almost anything!)
2. Glue gun and glue sticks
3. *PVC Pipe Glue* — it works well for adhering objects and gluing foam, it will "glue" almost anything, and it's less expensive (and toxic) than superglue.
4. Fabric glue and wood glue
5. Colored masking tape, fabric tape, and electrical tape
6. *X-acto™* Knife or utility knife
7. Solder gun (*RADIO SHACK's "Cool Grip Gun* #64-2066 works well)
8. Rosin core solder and lead-free solder
9. Thin long-nose pliers
10. Wire stripper
11. Awl or ice pick
12. Markers — permanent, washable, and *Vis-a-Vis™* (overhead transparency)
13. Ruler and tape measure
14. Wire strippers
15. Wire cutter
16. Drill
17. Safety goggles or glasses

Tools and Supplies for Single Switch Construction (and for modification/construction of toys)

1. Small boxes and plastic containers
2. Screwdrivers (regular and Phillips)
3. Cardboard
4. Foam pieces and scraps
5. Wood pieces and scraps
6. Disposable aluminum pans and containers
7. Plastic lids from margarine and other containers
8. Copper pipe pieces and copper U-brackets
9. Small nuts and bolts, screws and nails
10. Small washers (1" size or smaller)
11. Stuffed toys or objects
12. Foam sheeting
13. Plexiglas sheets or pieces
14. Double-sided foam tape
15. Double-sided carpet tape
16. Old Christmas tree lights (miniature)
17. Duct tape
18. Any item that you think there must be some use for, but you haven't found it yet!
19. Any item that looks like it may have little or no value!
20. Various electronic parts: The parts listed are available through many electronics stores. The list below contains part numbers from *RADIO SHACK™* (RS) and *ALL ELECTRONICS™* (AE).

1/8" 2-conductor Phone Plugs
(RS red: #274-287/RS black: 274-286)
22 gauge, 2-conductor Speaker ("stereo") Wire (RS#275-1566)
4 ft. cord with 2, 3.5mm (1/8") plugs
(AE #CB-353)
SPST Mini Momentary Pushbutton Switch
(RS #275-1556)
SPST Mini Momentary Pushbutton Switch
(AE #MPB-1)
SPDT 3/4" Lever Switch (RS #275-016)

SPDT 3/4" Lever Switch (AE #SMS-106)
Mercury Bulb Switch (RS #275-040)
Mercury Tilt Switch (AE #MS-5)
SPST Momentary Push Switch (RS #275-618)
"C" Battery Holder for 2 batteries
(RS #270-385)
1/8" two conductor Open Frame Jack
(RS #274-251)
Electronic Buzzer (RS #273-053)
9-Volt Battery Connectors (RS #270-325)

Suggestions for Using this Book

This book is divided into three sections:

1. Constructing Single-Switching Devices and Modifying Battery-Operated Devices
2. Communication, Interaction, and Choice-Making
3. General Low-End Technology Ideas Using Off-the-Shelf Materials and Toys

Each of the three sections provides an overview and discussion of the topic as well as instructions, diagrams, and photos of materials, devices, and strategies. The ideas, devices, and materials described in each section are by no means inclusive of the wide array of low-end technology possibilities. Instead, our work is designed to be a "jump-start" for your own creativity and designs. As you peruse the various sections, let your imagination "run free," and before you know it, you'll have amazingly creative ideas of your own that will support and facilitate the skills and abilities of individuals with disabilities.



Chapter One: Single-Switching Devices

Constructing Single-Switching Devices and Modifying Battery-Operated Devices

This chapter focuses on the design and construction of single-switching devices and modification of battery-operated devices. The chapter contains basic information about creating single-switching devices that address the user's needs, as well as construction tips and pointers. Switch wiring instructions, along with photographs and diagrams, will facilitate the design and construction of durable, appropriate, and "fun" switching devices.

In addition to the design and construction of single-switching devices, this chapter presents instructions for the modification of battery operated devices. Two strategies for device modification -- temporary modification through the use of a battery interrupter, and permanent modification through rewiring the device and adding an external jack -- are discussed. It is the authors' hope that the information contained in this chapter will assist in "sparking" creativity and providing a solid base of information relative to wiring, constructing, and modifying devices. Have fun!

Single-Switching Devices

Single-switching devices have a variety of uses for individuals with disabilities. They may function as a vehicle for the establishment of cause/effect relationships, forming the basis for the development of a wider and more sophisticated array of skills. They may serve as a functional environmental control device to permit the user to activate (and deactivate) items within the environment. Single-switches may also play a role in the establishment and maintenance of purposeful motor movements and skills. They may also serve as a vehicle for communication or to support drill and practice activities in a classroom or home environment.

There are a wide array of single-switching devices available on the commercial market. These commercially available switches are reliable and durable and are designed to interface with battery-powered devices, computers (through a switch interface), and electrical appliances and devices (through a control unit). Commercially-produced switches may also be quite expensive to purchase and are often beyond the reach of many school, agency, and family budgets. However, almost any type of a commercially produced single-switch can be re-created with a few inexpensive electronics parts and a little creativity.

Construction of a single-switching device is easy and fun, and there are some very creative and functional single-switches designed and built by families, teachers, therapists, and, most importantly, the user's peers. Any single-switch constructed will function and interface with the same battery-powered toys and devices, computers and electronic appliances as commercially-produced switches. The main difference is the cost of producing the switch and the ability to customize the switch to match the user's characteristics.

Basically, a single-switch is simply an on/off mechanism that is designed to permit the user to independently activate a device, a computer, or other items within the environment. Most switches are wired to activate through the user's pressing, squeezing, pulling, or manipulating the switch, or through other purposeful movements. Other switches are designed to require some problem solving on the part of the user in order for activation to occur. Some switches can be wired to be in the "on" position, requiring the user to activate the switch in order to turn off a device.

Hierarchy of Single-Switch Use

When planning to use switches as an activation device with an individual user, consider the progression of the user through the hierarchy of single-switch usage.

- STEP ONE:** **Single-Switch** – The hierarchy begins with the user employing a single-switch in the establishment of cause/effect, or means/end. The user depresses a switch to make something happen. Within this step of the hierarchy, the user should be encouraged to generalize the switch use to activate a variety of devices, and the switch should be interchanged with other switches to avoid the user's developing a belief that only one switch "works" to activate devices.
- STEP TWO:** **Two Switches** – In this phase of the hierarchy, cause/effect has been established, and the user is now presented with two switches that power two distinctly different devices. The element of choice making enters into this phase, and the user develops control over which device is activated, dependent on the user's choice.
- STEP THREE:** **Switch Activation Based on Auditory or Visual Cue** – The hierarchy continues with the user responding to a specific auditory or visual cue, depressing a switch in response to the prompt. The user may use one or two switches.
- STEP FOUR:** **Two Switches Attached to Same Device** – In this phase, the user must depress both switches in order to activate the device. This phase of the hierarchy promotes flexibility of thinking and problem solving.
- STEP FIVE:** **Switch and Control Unit** – In this final phase of the hierarchy, the user's switch is plugged into a Control Unit, and an electrical device is powered through the Control Unit. The variable in this phase is the ability to set a timer so the device remains on for a specified number of seconds/minutes. The user must recognize that when the device turns off, he/she must press the switch again to reactivate the device.

Characteristics of the User

When deciding what type of switch to construct, several user characteristics should be taken into consideration:

- 1. The user's cognitive abilities.** Has the user established cause/effect relationships? If not, what type of switch, activating what type of device, will have the greatest likelihood of facilitating the establishment of cause/effect relationships?
- 2. The user's communication level.** Is the user verbal? nonverbal? Is the user currently using any type of communication device? If so, what type of device, and how is it activated? What is the user's level of receptive language?
- 3. The user's physical abilities and range of purposeful movements.** Is the user ambulatory? What positioning considerations are important for the user? Does the user have greater upper body strength and coordination, or greater lower body strength and coordination? What are the user's most consistent purposeful movements? What movements are most comfortable for the user?
- 4. The user's sensory abilities.** What are the user's visual abilities? auditory abilities? tactile abilities?
- 5. The user's environments.** Where will the switch be used? At home? at work? at school? in the community? What type of demands does the user face in the environment where the switch will be used? What will the switch activate within the environment?
- 6. The user's likes and dislikes.** What shapes, objects, colors, textures does the user like, and more importantly, dislike? What shapes, objects, colors, etc., motivate the user to want to reach out and touch or interact with something?

7. **The user's chronological age.** What types of age-appropriate materials can be used to house the switch? How can the switch best be designed to reflect the user's chronological age and be a good "match" with the user's environment?
8. **The user's manifest and emerging skills.** What skills is the user working on developing? What skill areas are most critical for the user (fine motor, cognitive, language, social, etc.)?

In addition to the user's characteristics, it is important to remember that switches should always be used with specific goals and objectives in mind. These goals and objectives should be determined by the user's multidisciplinary team, with all team members assisting in determining what type(s) of switches are to be used, how the user should be positioned, the specific goals of switch use, and the environments where switches are to be used.

Safety Considerations

Once the user's characteristics have been determined and the goals and objectives for the single-switch use have been delineated, it is important to consider the following safety issues in the construction and use of single-switching devices:

1. Any switch designed and constructed must be safe for the user. All electronic parts must be sealed inside the switch and be inaccessible to the user. Attend carefully to the construction of the switch to insure that all soldered connections are sealed within the switch and are not available to the user. This is especially critical if the solder used is not lead-free.
2. The switch constructed must be reliable. In other words, it must work every time it is activated. If a switch is unreliable, the user (and the designer) can become frustrated and inclined to interact less frequently and purposefully with the switch.
3. The switch constructed must be sturdy and able to withstand abuse. When designing the housing for the switch, be sure that the housing will withstand being dropped, kicked, and hit with some force. A fragile switch can be frustrating to both the designer and the user.
4. The switch should be constructed in such a way that it can be easily cleaned and maintained. The material used for the switch housing should be able to be wiped clean with a damp cloth, or, if a cloth covering is used, the covering should be designed so that it can be easily removed and laundered.
5. The length of the switch cord should be considered to ensure that it will reach between the device and the user. Consider having cord-shorteners available to house the slack cord to allow the user to be closer to the device and avoid being tangled in loose cord.
6. The switch should use standard components that are readily available and replaceable in case of damage or switch malfunction.
7. The switch should have no sharp corners or edges and the user should not exhibit any skin sensitivity to particular types of materials that may be used to house the switch. If a mercury switch is being used, check carefully for cracks or breakage that may permit the mercury to leak out of the switch and come in contact with the user.
8. If the user has excessive saliva, be sure that all electrical components are sealed to prevent the saliva from shorting out the device or possibly shocking the user.
9. Plastic safety goggles should be worn when stripping wire for the switch or soldering switch components. The plastic and wire fragments that occur when stripping wire can easily make their way to the eyes, so be sure to be protected from this hazard. The vapors from soldering can be irritating to the eyes, and safety goggles prevent this irritation.
10. When soldering, remember to use pliers, a clamping device, or a "Double-Hand Holder" (RS #64-2093) to secure the parts being soldered and to prevent burns to fingers from the heat of the solder and solder gun. *RADIO SHACK* and other electronic stores market a product which has several "arms" with clamps that can be positioned to hold the parts to be soldered, allowing the soldering work to proceed safely.

There are a few other safety issues that focus on the device that the switch is activating. Be aware of users who may be prone to seizures and make sure that blinking lights, vibrations or other stimuli emitted by the activated device are not triggers for seizure activity. If the switch is plugged into a battery-powered device, check the batteries often to make sure they are good. Weak batteries can result in user frustration if the device does not activate or activates slowly or sporadically. Finally, if the switch is being plugged into a control unit to power an electrical device, check the control unit often to be sure that it is not overheating.

It is important to remember that single-switching devices can **only** be directly plugged into **battery-powered** devices. If the switch is going to be plugged into a computer, a switch interface box of some sort will be needed. Many of the adaptive/assistive technology companies market switch interface boxes, and many computer peripherals such as *KE:NX™* or the *Adaptive Firmware Card™* (*DON JOHNSTON, INC.*), *S.A.M.™* (*R.J. COOPER*), or *Intellikeys™* (*INTELLITOOLS*) can serve as switch interface devices. If the switch is going to power an electrical device, a Control Unit interface box is needed. These are available through *ABLENET* and other companies. **Never** plug a switch directly into a computer or an electrical device. **Always** make sure the correct interface is available.

Problem-Solving Single-Switch Design and Construction

When designing and constructing single-switches, some problem-solving will need to be done to ensure that the switch operates appropriately and meets the user's needs. Consider the following issues:

1. **How will the design ensure that the switch remains upright or positioned correctly so that it responds accurately to the user?** The bottom of the switch may need to be weighted to ensure that it remains upright. *Velcro™* or some type of anti-slide material may be used to ensure appropriate switch positioning and function. Be sure that the switch is mounted securely inside its housing to prevent the switch from moving inside the housing, turning, or falling over. Depending on the switch housing chosen, this may require some creative problem-solving to insure that the switch remains secure and does not move.

In the photos that follow, notice how the switch is securely mounted in foam scraps or cardboard to ensure that the switch remains upright and positioned appropriately for successful use.

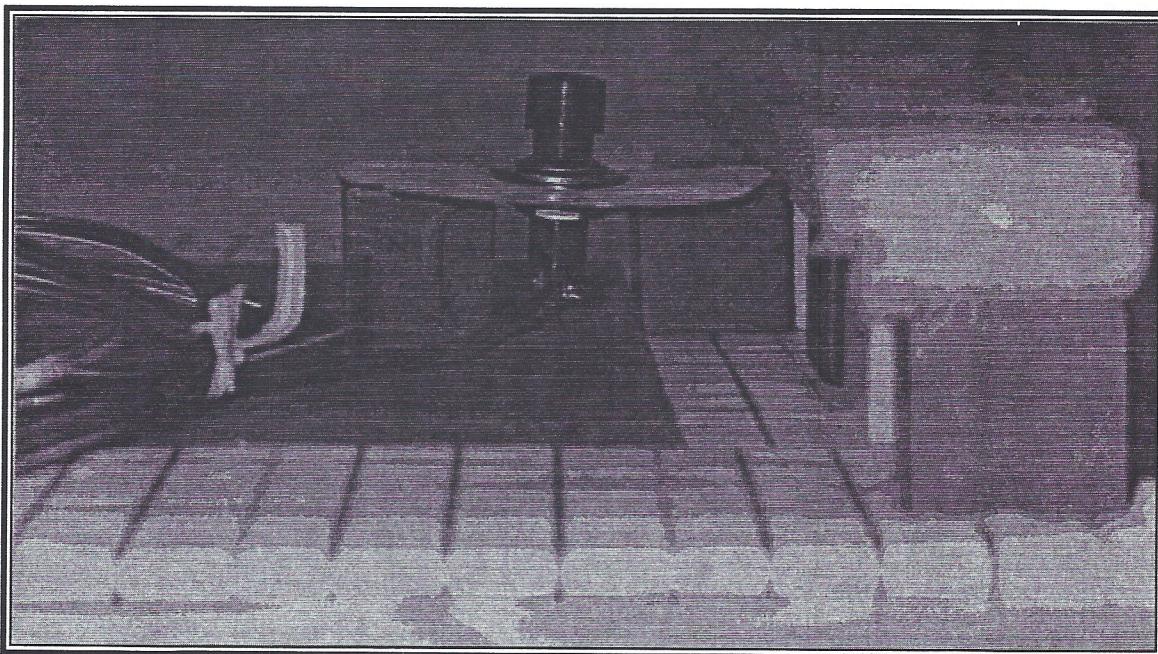


Photo 1: Momentary Pushbutton Switch mounted in cardboard piece and glued to two wooden blocks for stability.

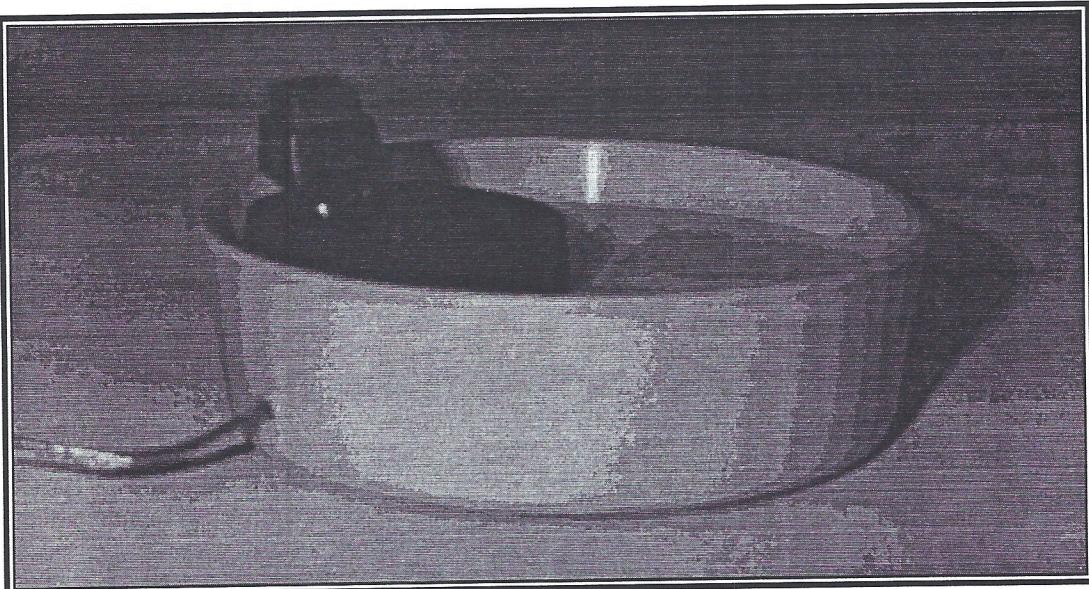


Photo 2: Momentary Soft-Feel Switch mounted in foam scrap and glued to an inverted yogurt container lid for stability.

2. How will the design ensure that the switch housing does not rest heavily on the switch and cause the switch to depress and turn on without the user's action? Depending on the switch housing chosen, this may require foam scraps around the switch (but not on top of it!) to ensure that the housing "springs back" from the surface of the switch and requires the user's action to activate. It may be necessary to problem-solve how to get the switch housing to "spring back" from the surface of the switch once the switch has been depressed. Lots of trial and error before finishing the switch will ensure good operation.

Notice, in the photo below, how the switch is positioned securely and surrounded by foam pieces to ensure that the switch housing will lift off the switch after the user has released the switch. Every switch housing will require problem-solving to ensure that the switch does not remain depressed after the user releases the switch.

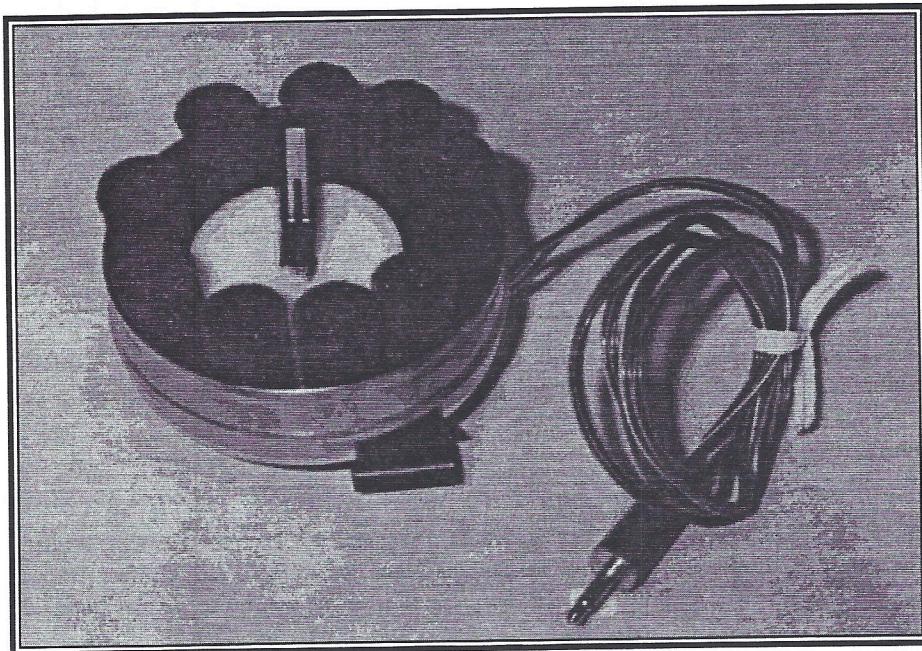


Photo 3: Lever Switch mounted in foam scrap and surrounded by cylindrical foam scraps to ensure that the switch housing will lift off the switch when released.

3. Where will the switch be placed inside the housing to best address the user's needs?

Where the switching mechanism is placed inside the housing is dependent on how precise the user is in terms of activating the switch. If the user's movements are not precise, the entire surface of the switch will need to be sensitive to pressure from the user. If the user is able to make more precise movements, then the sensitivity of the switch can be isolated to a particular portion of the switch housing. Again, trial and error and problem-solving during construction can assist in making the switch meet the user's needs.

The photo below illustrates a switch positioned inside a three-ring binder. The positioning of the switch ensures that anywhere the user presses on the binder cover will activate the switch.

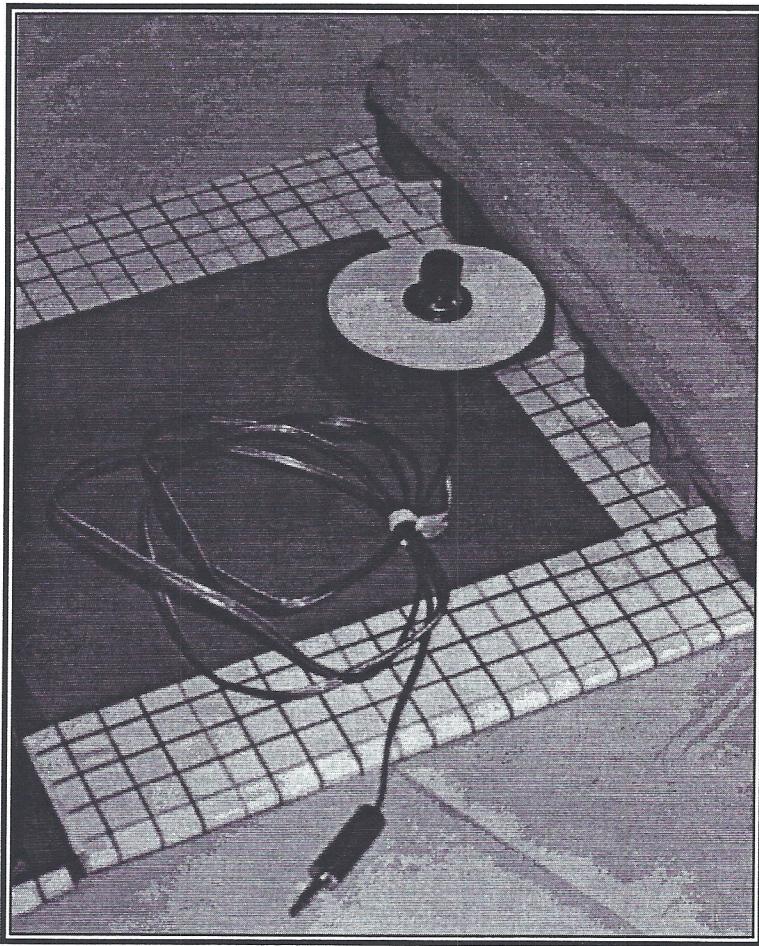


Photo 4: Momentary Pushbutton Switch mounted inside an 8½" × 11" three-ring binder.

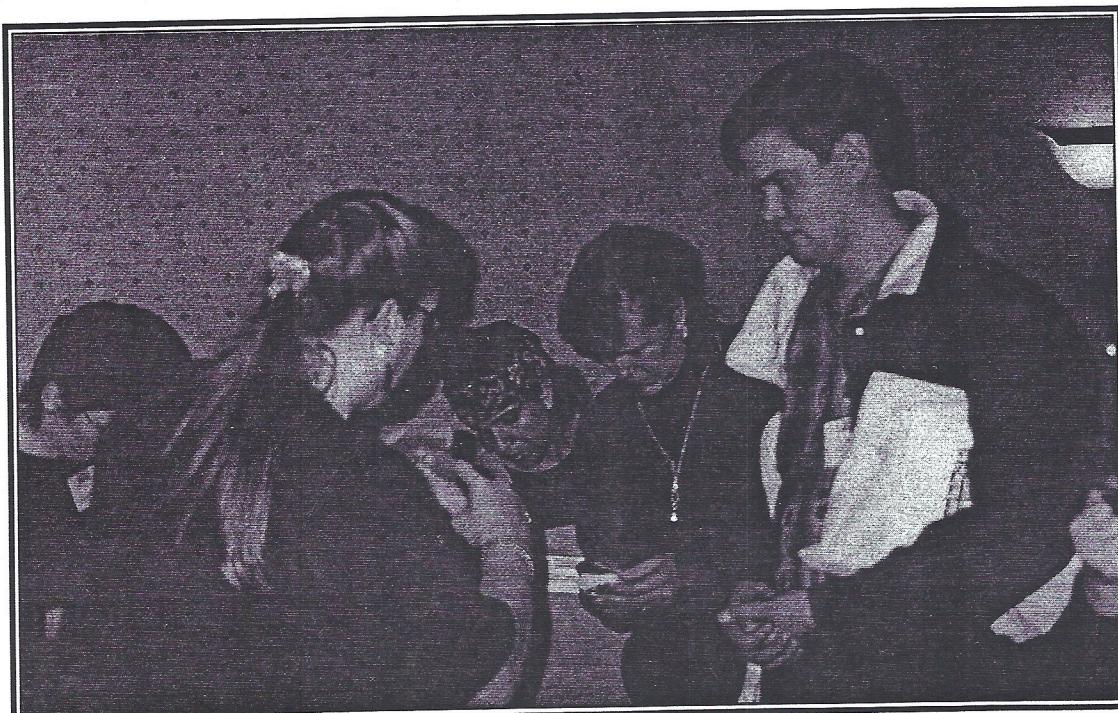
Oops . . .

- 4. Help! The switch is on all the time!** If this occurs, the problem is probably in the plug end of the switch. Unscrew the plastic cap and make sure that there is no bare wire inside the plug. Check to make sure that the stripped wire was pulled all the way to the plastic casing before it was soldered, and that any excess bare wire was cut off and removed before placing the plastic cap on the plug. If there is bare wire inside the plug, the wire will touch the metal of the plug and the switch will be turned on without the user's activation. If the plug is wired correctly, but the switch is still on, check the wiring of the switch mechanism to be sure that there is no bare wire. Make sure you trim away all bare wire on the switching mechanism after you solder.

Uses for Single-Switches

Single-switches can promote the development and enhancement of a variety of skills. Some possibilities include:

- Establishing cause/effect
- Introducing and establishing object permanence
- Establishing means/end relationships
- Purposeful interaction with objects and devices
- Increasing visual attending and visual tracking
- Increasing attention span
- Facilitating problem solving
- Enhancing picture and/or object discrimination
- Developing sound awareness
- Enhancing visual and auditory discrimination
- Developing turn-taking skills
- Decreasing tactile defensiveness
- Decreasing self-stimulation
- Facilitating interaction with peers and adults
- Developing purposeful motor skills, i.e., reaching, grasping, etc.
- Improving head and trunk control
- Establishing a "yes/no" response
- Indicating needs and choices – communicating
- Facilitating making requests, greetings, telling jokes
- Improving weight-bearing skills



Types of Single-Switches

There are basically six types of switches to be considered. The user's characteristics will help determine which type of switch is to be constructed. Construction details and diagrams for each type of switch are contained later in this section.

Push Switches

A push switch can be made using any of the *RADIO SHACK* or *ALL ELECTRONICS* push-type switches or can be constructed using a "metal to metal" principle. When designing a push switch the most important considerations are:

1. The user's strength
2. How the switch is to be pushed (with what body part)
3. The user's ability to "get off" the switch after it is depressed

If the user has limited strength, then a light touch switch or one that is extremely sensitive is needed (like the *RADIO SHACK* or *ALL ELECTRONICS Lever Switch* or the *Soft-Feel Switch*). On the other hand, if the user has lots of strength, then a more heavy-duty switch (like the *RADIO SHACK Momentary Push Switch*) is appropriate. When using the "metal-to-metal" approach, the assumption is that the user has at least average strength.

How the push switch is housed is where the creativity is limitless! Consider how the switch is to be pushed (with what body part), and then consider the user's likes and dislikes, what attracts the user, etc. When these things have been considered, look around for a housing for the switch that matches with the user's characteristics. Some examples include:

Stuffed Animals	Plastic coasters
3-ring Notebooks	Plastic reflectors
Small Boxes – plastic or cardboard	Metal boxes
Hinged lid boxes	Plastic containers
Rubber Toys	Any item that will enclose the switch and can be pushed down and spring back
Styrofoam "sandwich"	

Pull Switches

Since "pull" is the opposite of "push," all of the design issues discussed for push switches apply ... except in reverse. Again, the user's strength needs to be considered, how the switch is to be pulled, and the user's likes and dislikes. Give consideration to how the user will "grab onto" the pull and how much accuracy the user has in connecting with the pull. How the switch will be mounted is also an issue to consider. The *RADIO SHACK Soft-Feel Switch* works well for a pull switch, and the "metal-to-metal" principle works even better. Some possible examples of housing for a pull switch are:

- 35 mm film canisters
- Cylindrical metal cans
- Cylindrical cardboard tubes with metal bottoms

Squeeze Switches

Many of the same considerations in the design of push switches need to be considered when constructing a squeeze switch. Consideration should be given to how the switch is to be squeezed: against the body, in the hand, between two hands, between the knees, etc. This will obviously determine the size of the switch. *RADIO SHACK* and *ALL ELECTRONICS* Lever Switches work well for squeeze switch construction, or a "metal-to-metal" approach can be used. Housing the squeeze switch again calls for creativity coupled with user likes and dislikes. Some possibilities include:

- Soft plastic water squeeze toys
- Foam "sandwich"
- Foam bicycle grips
- Old neckties
- Foam sheeting

- Socks
- Small stuffed animals or toys
- Plastic tubes
- Soft plastic dog/cat toys
- Soft foam balls

Movement Switches

Designing a movement or motion switch involves considering what movement is to be reinforced, or what movement is to be extinguished. For example, if a user's head remaining in midline is the goal, then the motion switch needs to be activated when the user's head is in the appropriate position, and the switch should be deactivated when the position is inappropriate. The major consideration in the design of the switch is how the switch is placed to be sensitive to the appropriate motion, movement, or position. The *RADIO SHACK Mercury Switch* and the *ALL ELECTRONICS Mercury Switch* work very well for movement switches and are relatively durable. Make sure that the glass bulb of the switch (which contains the mercury) is secured inside the housing of the switch so there is no possibility of injury to the user through glass breakage or mercury leakage.

It is important to note that the federal government's *ENVIRONMENTAL PROTECTION AGENCY (EPA)* has placed restrictions on the availability of mercury switches. At the time of the publication of this book, *RADIO SHACK* indicated that they were no longer manufacturing the mercury switch and availability of these switches would be limited. *ALL ELECTRONICS* will continue to market their mercury switch, which is a recycled switch, and plans to remain a ready supplier of these devices.

Some possible ideas for housing a movement switch are:

- On a headband
- On a sweatband
- On a barrette
- On a bandanna

- On a baseball cap
- On a belt
- On a rolling, rocking, or dumping toy



Metal-to-Metal Switches

"Metal-to-metal" switches are switches that are truly created from junk! Any two pieces of metal will work

to complete the electrical circuit and activate the switch. If metal cans are used, the metal parts where the connection is to be made need to be sanded to remove the glossy sealant that protects foods that are packaged in cans. Copper is a great conductor, as are pieces of disposable aluminum pans and metal washers.

Possible housings for "metal-to-metal" switches are:

Metal pans and metal objects
Metal cans and copper pipe
Report covers or tag board
Foam sheeting

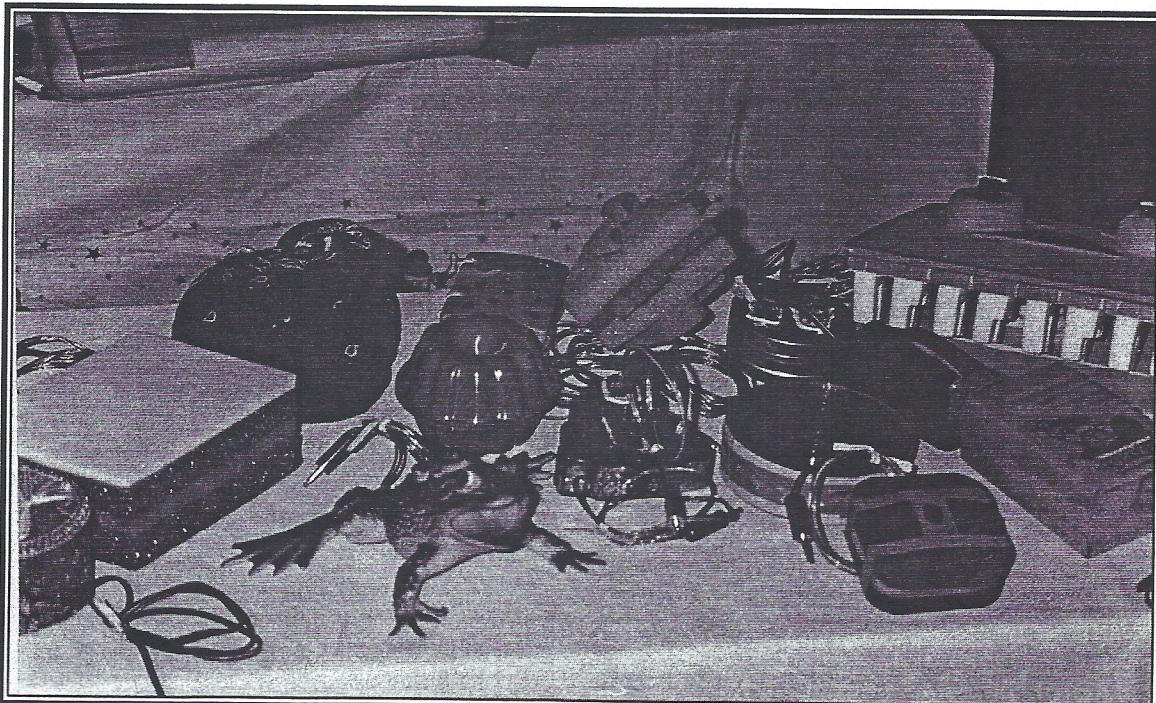
Plastic play food
Plastic window decals
Checkbook covers, wallets, date books, address books, etc.

Proximity Switches

Proximity switches can be used when the user is not able to consistently connect with a switch but is able to get within close proximity to the switch. A proximity switch works through magnets and a magnetic field. The user can "swipe" close to one half of the magnetic switch and successfully activate the switch. *RADIO SHACK* markets a *Magnetic Switch* (RS #49-532) that is an excellent choice for the construction of a proximity switch. This type of switch works particularly well as a head switch, an arm switch, or a hand switch.

If used as a head switch, one half of the magnetic switch needs to be secured to the user's headrest, and the other half of the switch attached to a headband or barrette clip of some type. As the user leans his/her head toward the headrest and gets close to the mounted part of the switch, the magnetic field triggers the switch to operate. The same principle applies if used as a hand or arm switch, but in this case, one half of the switch would need to be secured to the user's tray or wheelchair and the other half of the switch attached to a wrist or armband. Used in this way, the user simply "swipes" with his/her hand or arm, and when close to the mounted portion of the switch, the magnetic field activates the switch.

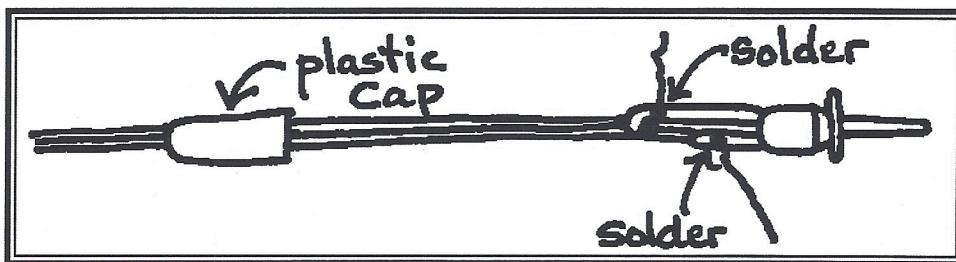
Since the proximity switch uses magnets and establishes a magnetic field, you must be particularly careful to ensure that this type of switch is not placed close to a computer, monitor, television screen, or computer disks. Magnets can be damaging to these types of electronic devices.



Putting the Switch Together

Wiring the Plug

Wiring the $\frac{1}{8}$ " Phone Plug is often the most frustrating part of switch construction. The "secret" to successful plug wiring is to remember to avoid having bare wires touching inside the plug. To avoid this problem, looking at the "legs" of the plug and noticing that the holes are not placed symmetrically in the plug legs will assist in wiring correctly. One piece of wire must be stripped approximately $\frac{1}{4}$ " more than the other piece to accommodate the placement of the holes in the legs of the plug. Using the holes in the plug legs as a guide for stripping the plastic covering from the wire, thread the stripped wire from the inside of the plug to the outside. Solder the wires to each leg of the plug, and cut off any excess bare wire after soldering. The diagram below may be helpful.



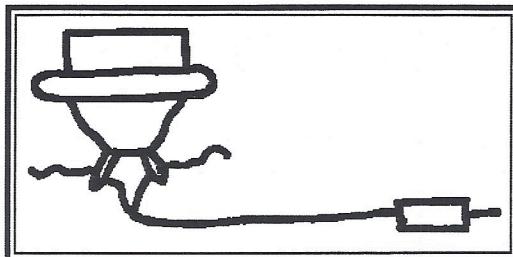
The All Electronics company carries a 3.5 mm ($\frac{1}{8}$ ") plug pre-wired to a cord. These pre-wired plugs and cables eliminate the need for plug wiring. Sometimes the company carries this product with plugs at both ends of the cord, providing the materials necessary to wire two switches. Either way, these pre-wired plugs and cords eliminate the difficulties sometimes encountered in wiring the plug.

Wiring Switches

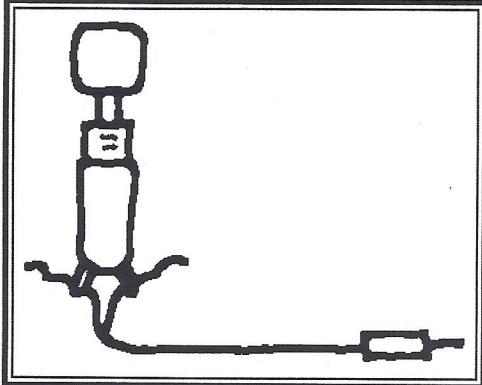
The drawings that follow illustrate the wiring of six basic Radio Shack switches and a metal-to-metal switch. In each case, approximately 6" of the "switch end" of the 22 gauge wire is first split into two separate wires, and then approximately 1" of the plastic coating of each wire is stripped from the wire before threading the wire into the switch.

SPST Soft-Feel Momentary Switch (RS #275-1566)

When wiring the Soft-Feel Switch, strip about $\frac{3}{4}$ " of plastic from each half of the wire, making sure that the plastic casing on the wire is "even" on both pieces of wire. Twist the stripped wire so that it makes a "needle" that can be threaded through the holes on the "legs" of the switch. Thread the wire from the inside of the switch "leg" to the outside, pulling the wire all the way up to the plastic casing to ensure that there is no bare wire between the "legs" of the switch. After threading the wire through both legs of the switch, solder the wire to each switch "leg" at the hole and cut off any remaining bare wire.

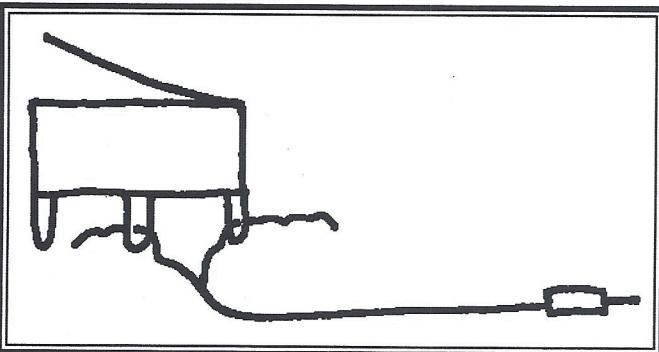


When wiring the Soft-Feel Switch, strip about $\frac{3}{4}$ " of plastic from each half of the wire, making sure that the plastic casing on the wire is "even" on both pieces of wire. Twist the stripped wire so that it makes a "needle" that can be threaded through the holes on the "legs" of the switch. Thread the wire from the inside of the switch "leg" to the outside, pulling the wire all the way up to the plastic casing to ensure that there is no bare wire between the "legs" of the switch. After threading the wire through both legs of the switch, solder the wire to each switch "leg" at the hole and cut off any remaining bare wire.



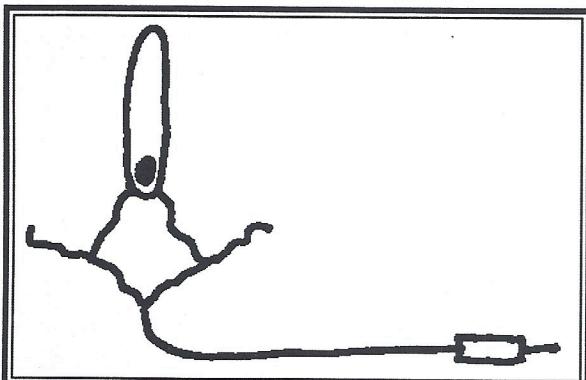
SPST Mini Momentary Pushbutton Switch (RS #275-1556)

The *Mini Switch* wires the same way as the *Soft-Feel Switch*. Again, remember to make sure there is no bare wire between the “legs” of the switch to ensure that the switch operates appropriately.



SPDT 3/4" Lever Switch (RS #275-016) or (AE #SMS-106)

When wiring the *Lever Switch* be sure to check the wiring with the diagram above. The *Lever Switch* has three “legs,” but only two legs need to be wired. The wiring process is identical to the *Soft-Feel* and *Mini Switches*. After soldering the wire to the “legs,” make sure to trim away the excess stripped wire.



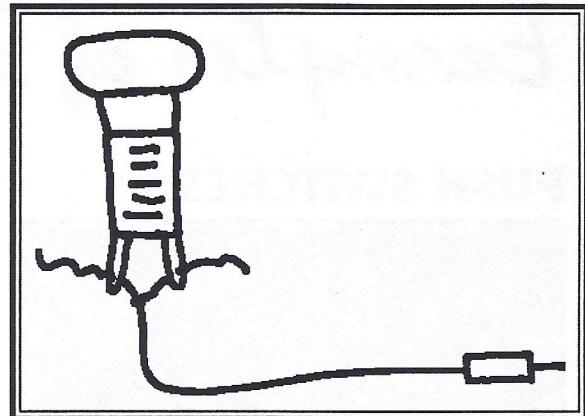
Mercury Bulb Switch (RS #275-040) or (AE #MS-5)

The *Mercury Bulb Switch* is wired differently from the other switches. Strip both pieces of wire approximately 1", making sure that the plastic wire casing is even on both sides. Twist each piece of bare wire so it is stable. Take one “leg” of the mercury switch and one piece of wire and twist them together, making sure that the plastic casing of the wire is against the bottom of the glass bulb. There should be no bare wire between the plastic casing of the wire and the

glass bulb of the switch. Do the same with the other “leg.” Apply a thin strip of solder to hold the wires together on each leg, and then trim the soldered wire to approximately 1/2". Using electrical tape, wrap the soldered wire to the plastic coating of the wire leading to the plug, making sure that the soldered wire is completely covered with tape. This prevents the soldered wires from touching and activating the switch without the user’s movement.

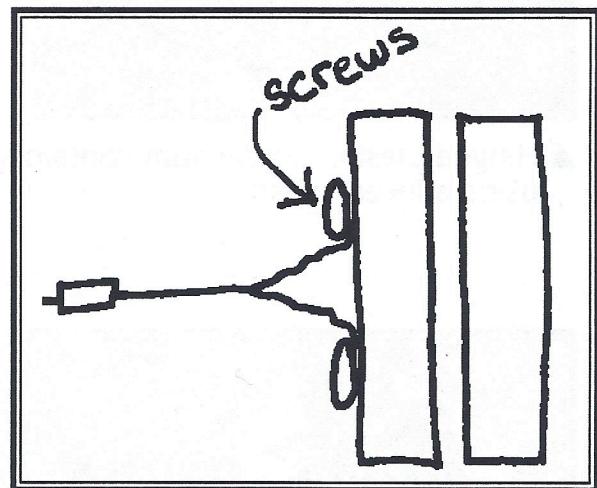
SPST Momentary Push Switch (RS #275-618)

The wiring process for the *Push Switch* is identical to the wiring of the *Soft-Feel* and *Mini Switches*.



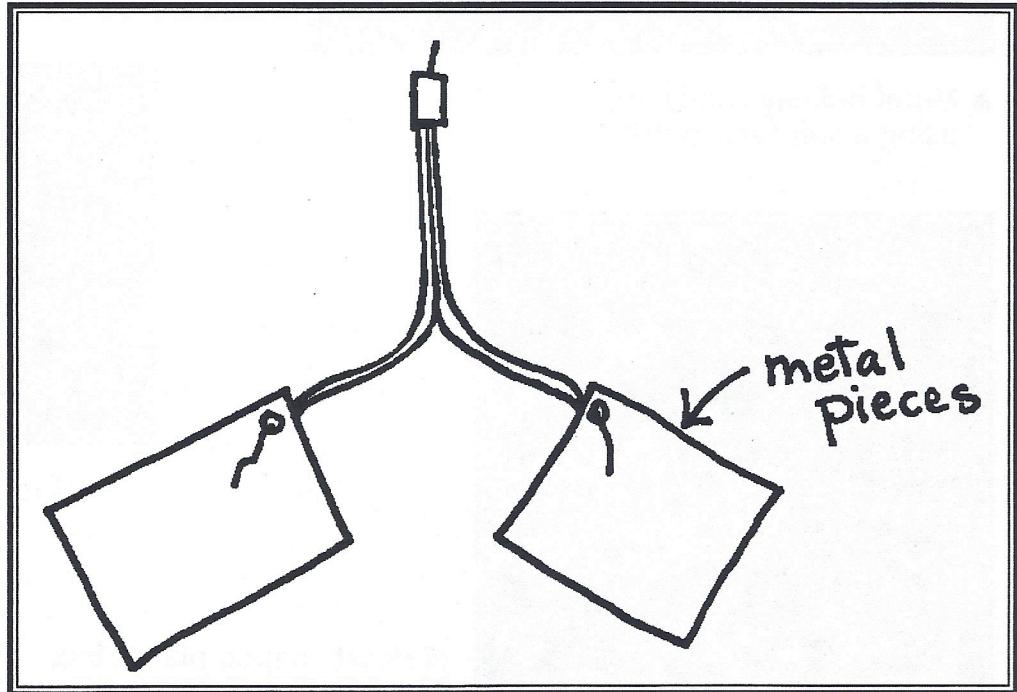
Proximity Switch (Magnetic Switch RS #49-532)

The Proximity Switch is very easy to wire. Notice that one half of the switch contains two screws. Simply unscrew the screws, wrap the stripped wires around each screw, and tighten the screws. The Proximity Switch is wired!



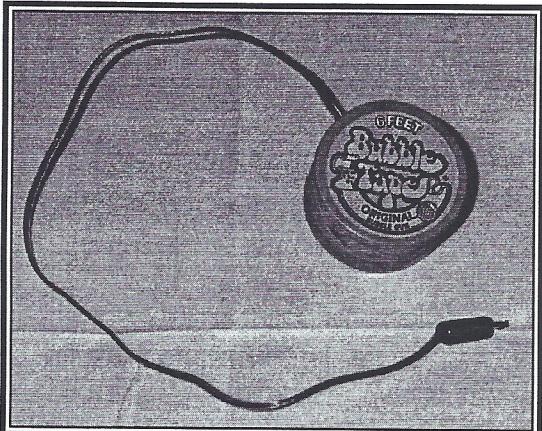
Metal-to-Metal Switch

Wiring a Metal-to-Metal Switch requires attaching the stripped ends of the wire to each piece of metal and soldering the bare wire onto the metal piece. The "secret" to constructing this type of switch is to make sure that the stripped wire is attached to the piece of metal all the way to the plastic covering of the wire. In other words, make sure there is no bare wire between the metal piece and the plastic covering of the wire.

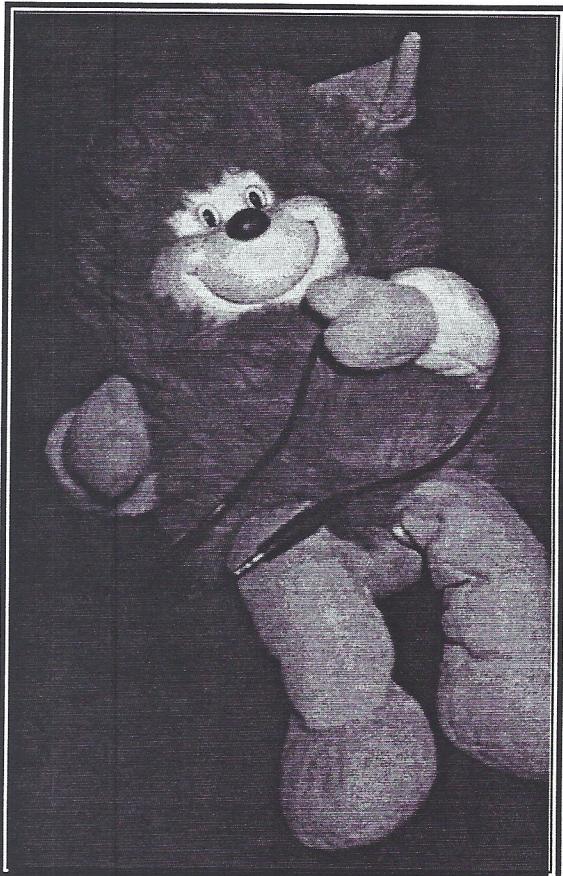


Examples of Six Types of Switches

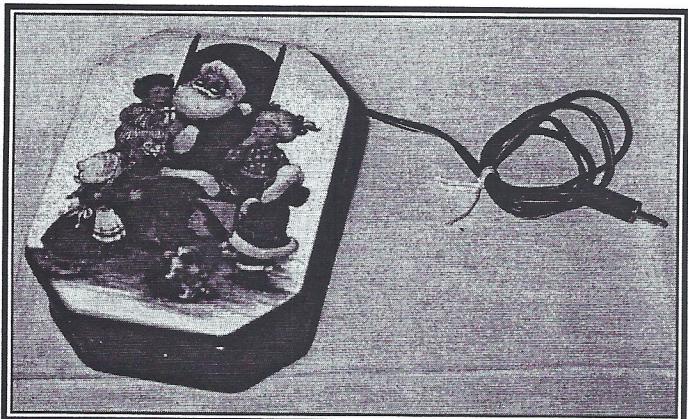
PUSH SWITCHES:



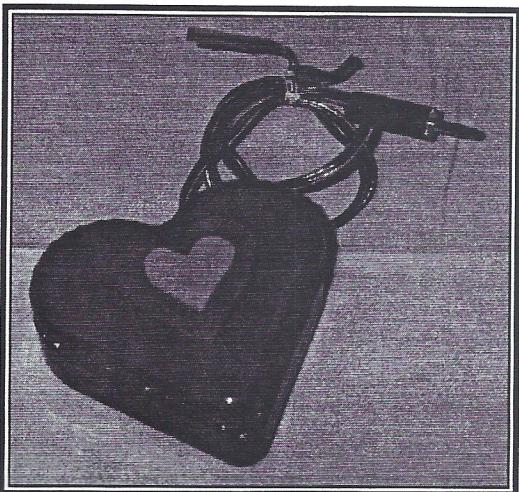
▲ Hinged plastic bubble gum container, using a lever switch.



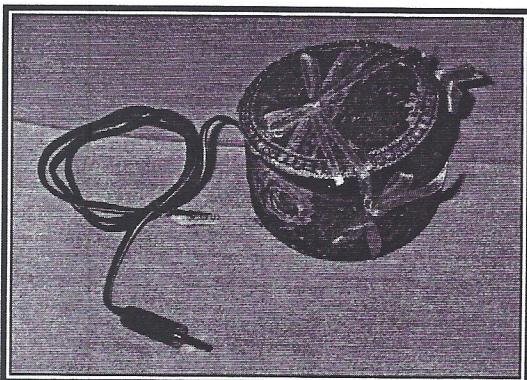
▲ Stuffed animal with a lever switch.



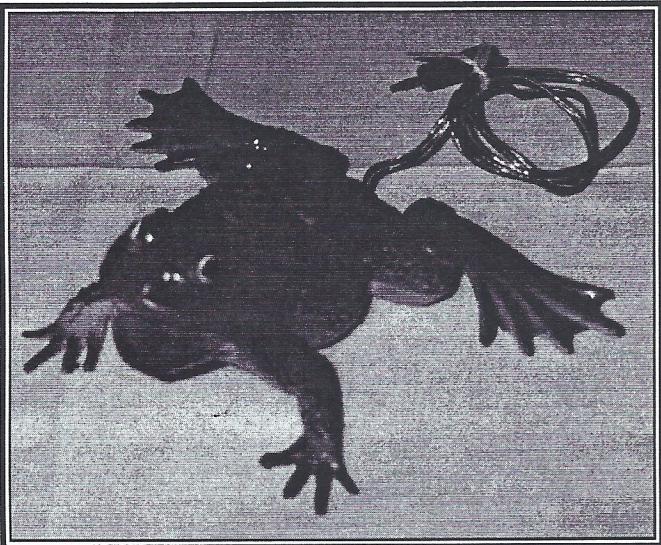
▲ Metal holiday candy tin, using a soft-feel switch.



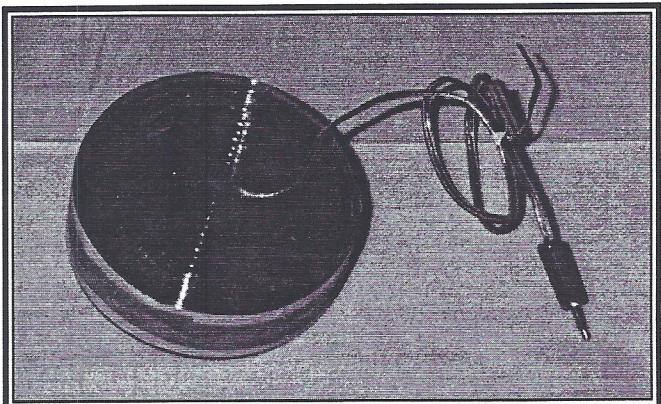
◀ Heart-shaped plastic box, using a lever switch.



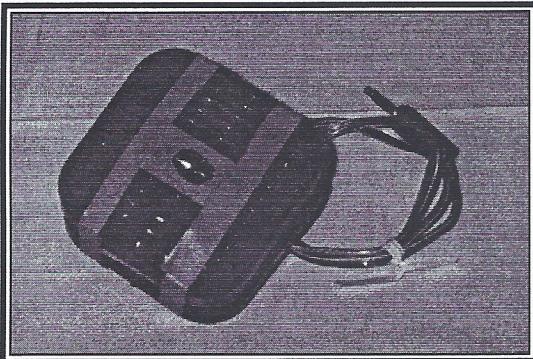
▲ Cloth-covered, hinged jewelry box, with a lever switch.



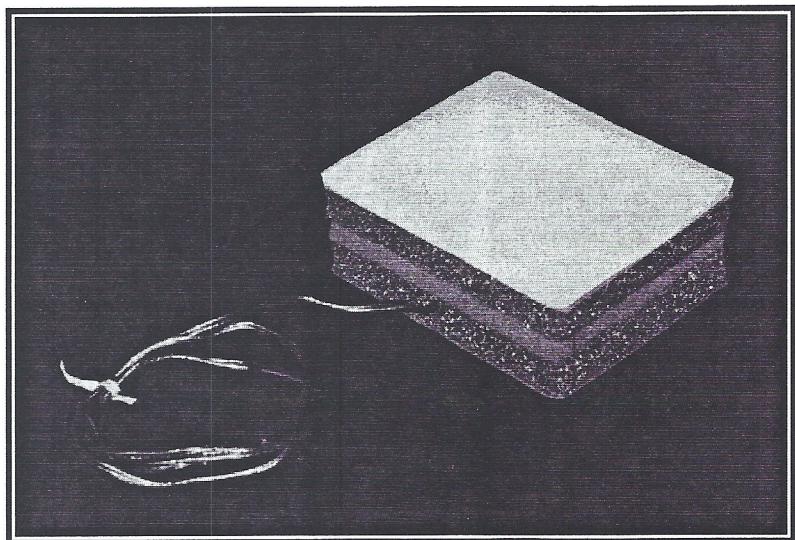
▲ Soft plastic frog toy,
with a soft-feel switch.



▲ Plastic coasters, using a lever switch.

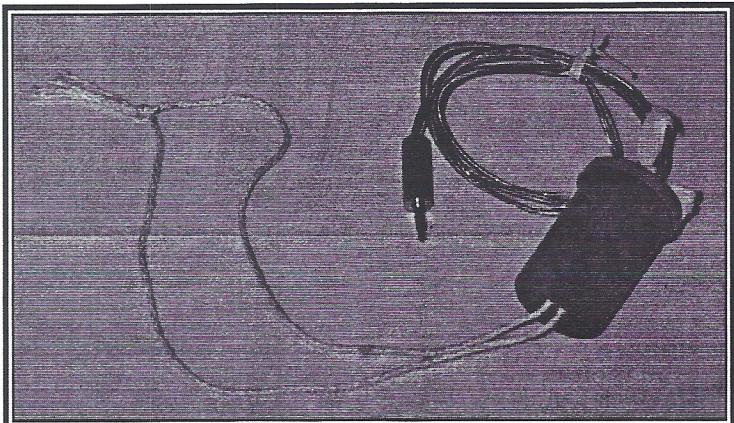


▲ Tail light covers, with
a lever switch.



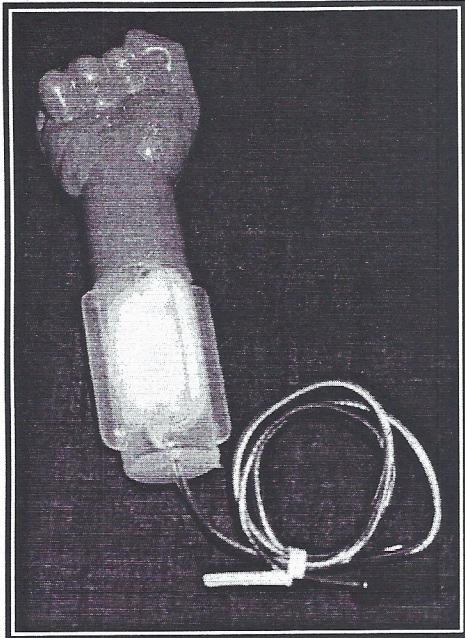
► Foam "sandwich,"
using a lever switch.

PULL SWITCH:



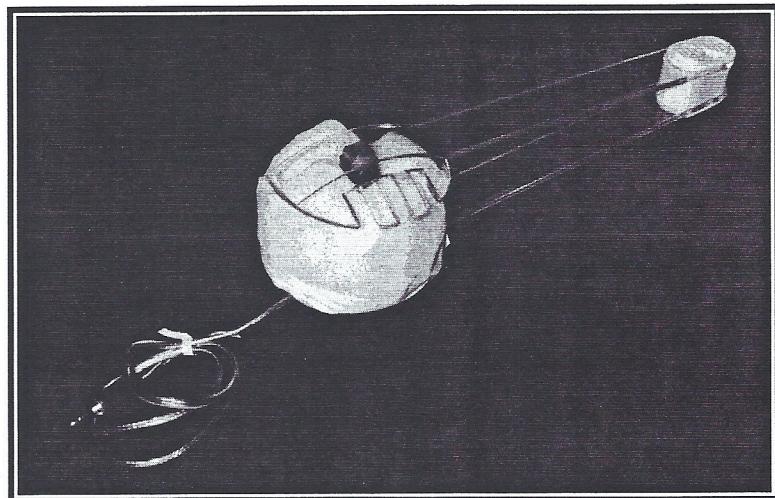
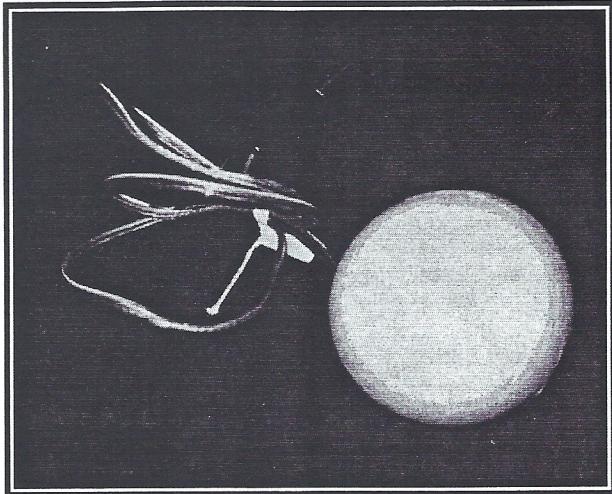
► 35 mm Film Canister pull switch
using two metal washers.

SQUEEZE SWITCHES:



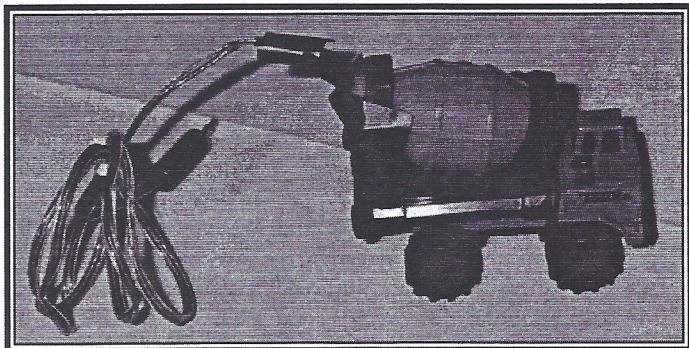
▲ Soft plastic candy container, using a lever switch.

► Soft foam ball, with a lever switch.



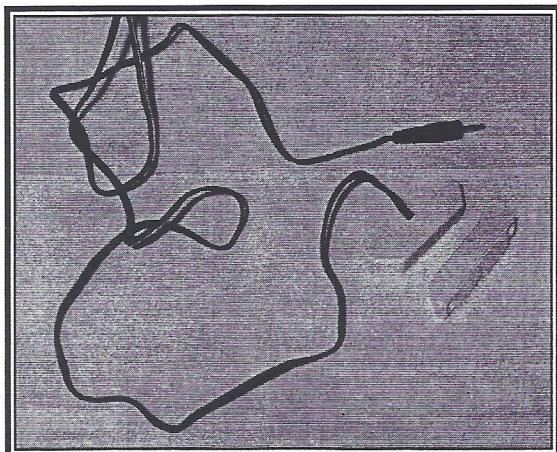
► Plastic salad tongs, using a soft-feel switch.
(Can be squeezed or pushed.)

MOVEMENT SWITCH:



► *Tonka™ Cement Mixer Dump Truck*, with mercury switch mounted inside the "mixer" component of the truck.

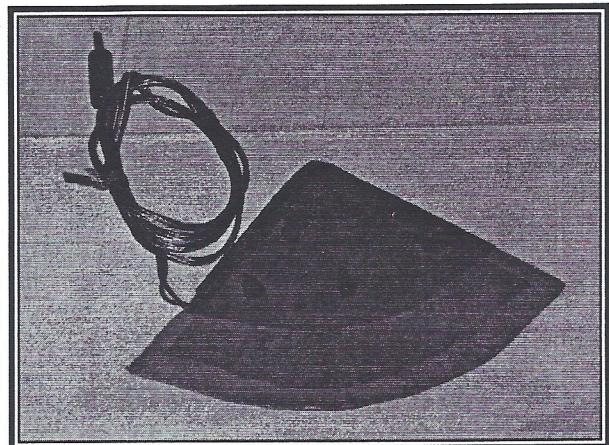
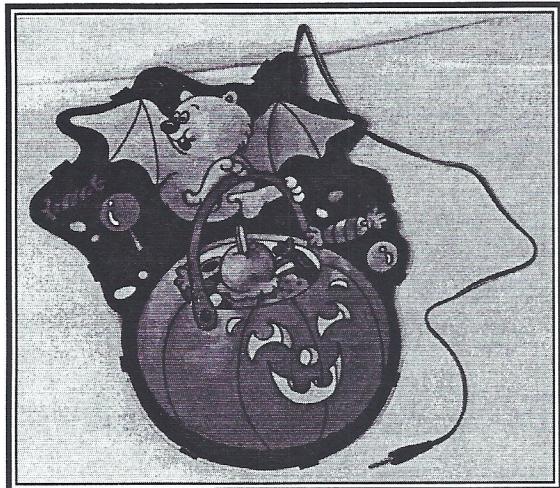
PROXIMITY SWITCH:



► Proximity switch, with *Velcro™* to attach to appropriate user supports.

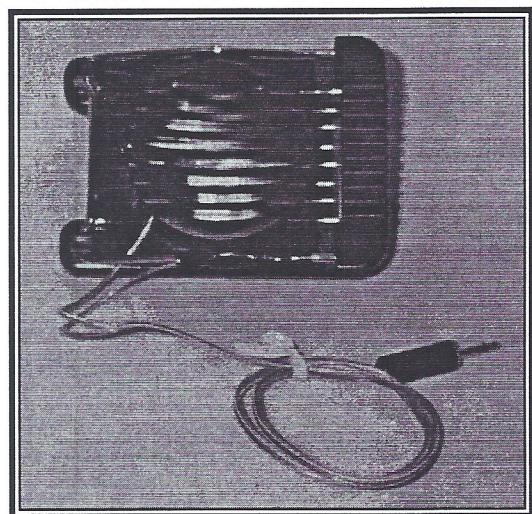
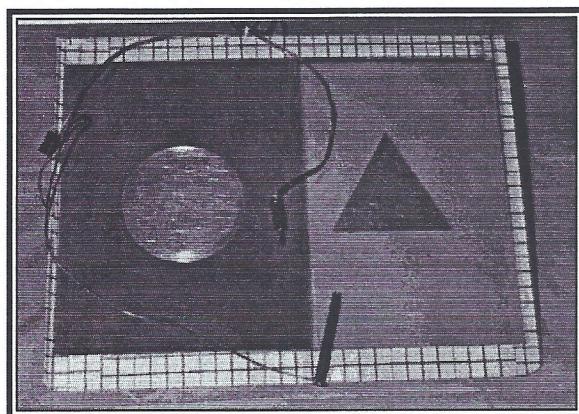
METAL-TO-METAL SWITCHES

► Tag board watermelon switch, using disposable aluminum pan pieces as conductors.



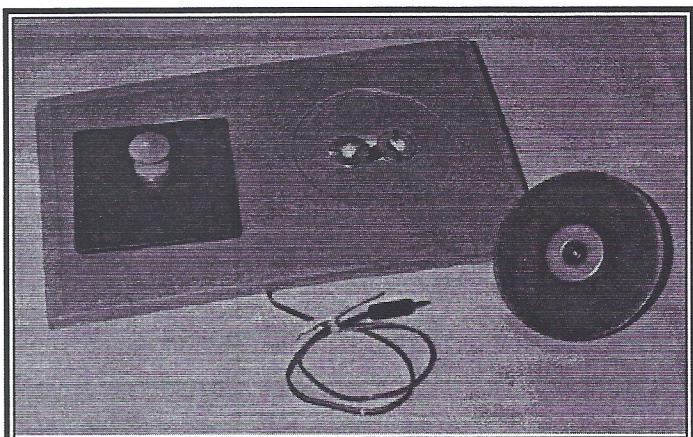
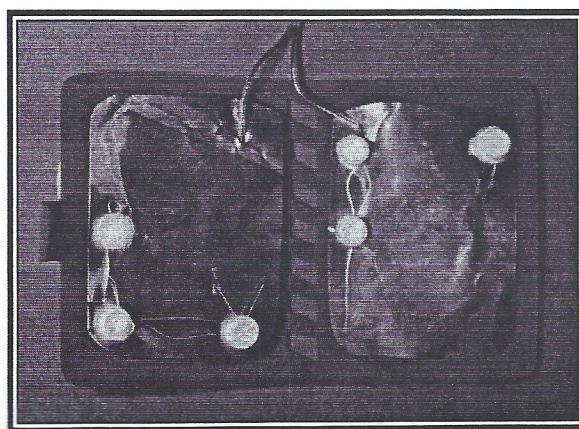
◀ Plastic window decals, with disposable aluminum pan pieces as conductors.

► Egg slicer, using disposable aluminum pan piece and metal tines of the slicer as conductors.



◀ Metal cookie sheet with geometric shape templates, using a metal bolt as a writing instrument and the metal cookie sheet as the conductor.

► Puzzle switch, using metal washers as conductors.



◀ "Inside" view of the metal to metal switch construction, using disposable aluminum pan pieces and foam scraps.

Single-Switch Creation Suggestions

When designing and constructing single-switching devices, it's a good idea to be able to test the switch throughout its construction. If switch-accessible toys and devices are available, these can be used to test the switch. If switch-accessible toys or devices are not available, consider building a "switch testing device" using batteries and a simple buzzer. If a buzzing device is not desirable, two miniature Christmas tree lights can be substituted for the buzzer.

The switch can be plugged into the jack, and when the switch is "closed" (activated), the buzzer should sound. It's a good idea to test the switch throughout its construction to avoid completing the switch only to find that it does not operate properly.

"Buzzing" Switch Testing Device

Materials:

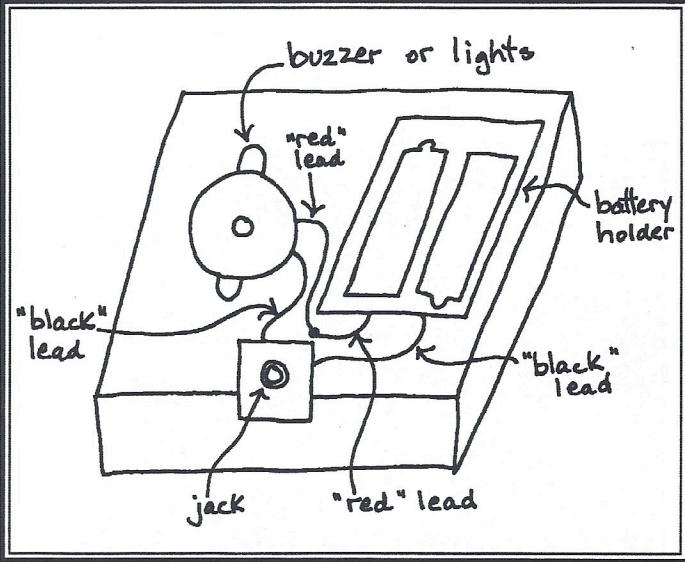
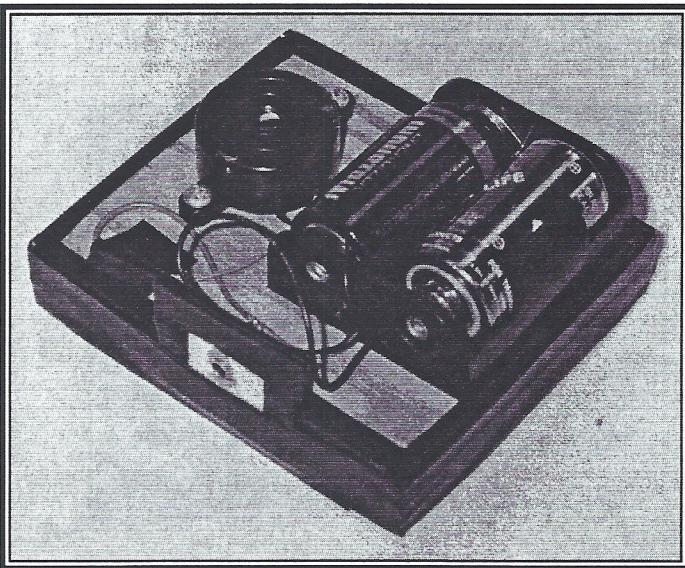
- 5" square piece of wood, $\frac{1}{2}$ " to $\frac{3}{4}$ " thick
- 3" square piece of sturdy cardboard
- Electrical tape
- "C" Battery Holder for 2 batteries (RS #270-385)

- 2 "C" batteries
- 1 ($\frac{1}{8}$) two-conductor Open Frame Jack (RS #274-251)
- Electronic Buzzer
(RADIO SHACK 273-053, \$2.49)

Process:

1. Connect "red" lead from buzzer to "red" lead from battery holder, and tape connection.
2. Thread "black" lead from battery holder through hole on one leg of jack, and solder.
3. Thread "black" lead from buzzer through hole on other leg of jack, and solder.
4. Unscrew nut from jack.
5. Make hole in cardboard and mount jack in hole, screwing on nut to hold jack in place.
6. Mount battery holder on wood block.
7. Mount buzzer on wood block.
8. Tape edges of block to avoid splinters, and tape cardboard piece with jack installed onto edge of block.
9. Insert batteries in holder.

NOTE: If Christmas lights are used instead of the buzzer, simply cut two lights off the strand, leaving 3 inches of wire on the base of each light. Strip the wires approximately $\frac{1}{2}$ " from bottom. Twist one wire from each light together, and attach one of the remaining wires to the red lead from the battery holder and the other wire to the black lead.



Modification of Battery Operated Toys and Devices

In order for many users to be able to independently access battery-operated toys and devices, it is necessary to modify these toys and devices to meet the user's unique needs. There are three ways to think about the modification of toys and devices:

1. Modify the device for switch access on a temporary basis using a battery or circuit interrupter
2. Modify the device for switch access permanently by rewiring the toy and installing a switch jack
3. Modify access to the device by making buttons larger, adding an extension to a toggle switch, or modifying access in a variety of other ways

The user's characteristics and needs should determine what type of modification is necessary and useful. Once the appropriate type(s) of modification(s) have been determined, the device-modification process is ready to begin. Instructions for constructing a battery interrupter and making permanent switch-accessible modifications to battery-powered toys and devices are detailed below.

Battery Interrupter

A battery interrupter (or circuit interrupter) is a device that fits in the battery case of a toy to temporarily modify that toy to be switch-accessible. After constructing the interrupter, slide the copper end into the battery housing between the "bump" end (positive terminal) of the battery and the metal piece inside the battery housing that rests against the positive terminal ("bump" end) of the battery. The copper pieces may need to be trimmed so they fit inside the battery housing and permit the battery housing lid to close. It will be a tight fit, so prepare to use a little "muscle"!

Materials: $\frac{1}{8}$ " 2-conductor Inline Phone Jack (RS #274-333)

8" piece of 22 gauge wire

2 copper disks made of thin copper foil, or 1 disk of thin double-sided circuit board material

Small piece of manila folder

Process: 1. Cut 2 circles of foil (or one circle of circuit board) about the size of a dime.

**If using double-sided circuit board, omit steps #2, 3, & 4.

2. If using foil, cut a circle from the manila folder that is slightly larger than the foil pieces.

3. Adhere the foil circles to both sides of the manila circle (use double-sided carpet tape).

4. Trim excess manila circle to match with copper pieces.

5. Split one end of the wire approximately $\frac{3}{4}$ ", and strip both wires.

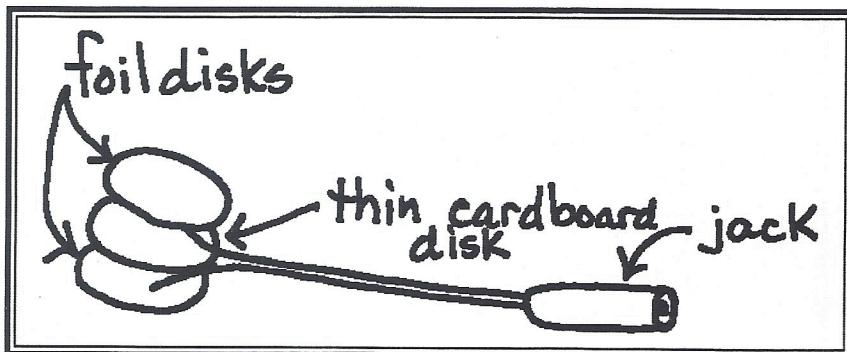
6. Solder wire to copper disks (one wire on each disk.)

7. Split and strip $\frac{3}{4}$ " of wire on other end for the jack.

8. Unscrew plastic cap from jack, and thread wire through holes in "legs" (just like wiring the plug).

9. Solder and clip extra stripped wire after soldering.

10. Replace plastic cap on jack.



Permanent Single-Switch Access for Battery-Operated Toys and Devices

Making a battery-powered toy or device permanently switch-accessible requires rewiring the device and basically bypassing the device's original switch. This type of modification frequently requires some basic experimentation and a lot of patience! Gathering a few devices that are not too "valuable" to experiment on before beginning to modify more expensive or valuable devices is recommended. In other words, this is an activity that requires some practice before it's mastered, so plan and prepare accordingly!

Gather the following materials:

1. 6" piece of insulated wire (one half of a piece of 22 gauge wire works well)
2. 8" piece of 22 gauge wire
3. 1/8" 2 conductor Open Frame Jack (RS #274-251)

A solder gun, drill, and wire strippers should be available, as well as some small screwdrivers.

The first step of the process is to take the device apart, making sure that you note how the pieces fit together for reassembly. Although this sounds like a rather basic step, it is the step that has the least attention given to it in the excitement of getting the device modified! It is important to not only note how the device reassembles but also make sure that all of the "parts" that are removed from the device are carefully labeled and saved so that they can be reassembled correctly.

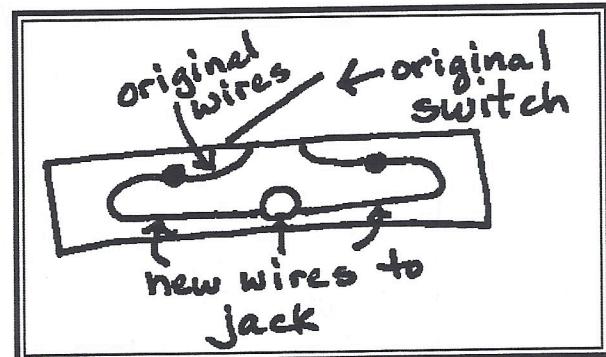
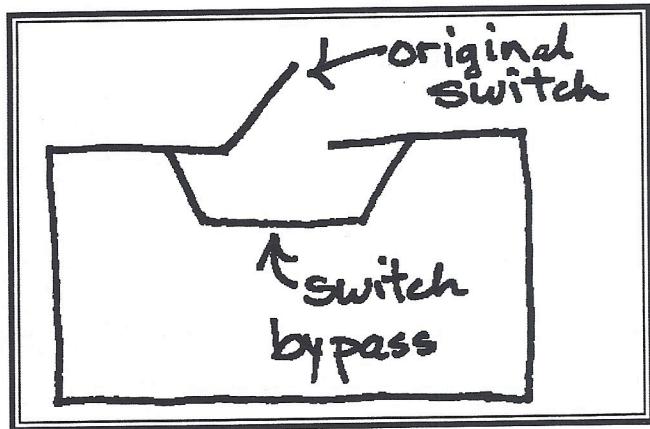
Once the device has been taken apart, locate the original switch and wiring. The task is to by-pass the original switch, ensuring that it is still operable, and add a new switch, which is really the switch jack. Since each battery-operated device has its own unique set of wiring, de-

determine which parts of the circuitry make the device work. The easiest way to approach this task is to strip both ends of a single piece of wire (one half of a piece of 22 gauge [speaker] wire works well) and touch one end of the wire on one of the soldered joints near the original switch, and then touch the other end of the wire to the other soldered joint. If the device operates, you've found the positions for your switch bypass. The diagram to the left may be helpful.

Once the switch bypass points have been identified, cut a piece of 22 gauge (speaker) wire to the desired length (about 8 inches is a good length) and split the wire approximately 2–3 inches. Strip approximately 1/2 inch of the plastic from the end of each piece of wire.

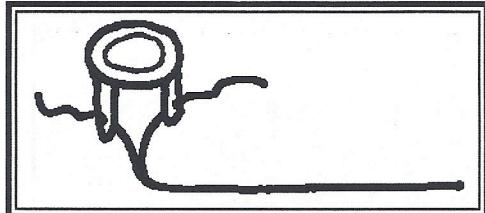
Now, solder one piece of wire onto one of the soldered joints on one side of the original switch, and solder the other piece of wire to the other joint. When soldering, make sure to leave no exposed wire. Solder the wire all the way to the plastic coating. Be sure when soldering that no wires are loosened or disconnected from the original switch. If this occurs, resolder the original wires and the new wire until they are secure.

Once the wires have been soldered, locate a place on the body of the device to install the switch jack. Make sure that the location chosen is close to the



original switch. Drill a hole in the body of the device that will accommodate the Open Frame Jack.

Measure the distance between the soldered wires and the location for the switch jack, and trim the 22 gauge wire to reach from the solder points to the switch jack, allowing at least 1 inch for "wiggle room." Separate the loose end of the 22 gauge wire approximately 1 inch, and strip the plastic coating approximately $\frac{1}{2}$ inch. Feed the stripped wires through each of the two holes in the switch jack "legs, and solder. Cut any remaining bare wire after it has been soldered.



Install the switch jack in the device, screwing the jack tightly to the body of the device. The device is now ready to accept any switch and be powered by the external switching device.

When modifying battery-operated devices it's always a good idea to continue to test your modifications throughout the process to be sure your modification works. With some devices it may take more than one "try" to have a successful modification, so be patient!

Safety Considerations:

If the device has more than one operational function (such as music and motion), each function may need to be wired separately (two jacks/two switches) to prevent overloading the circuit. Watch for smoke! If the device begins to smoke, the circuits are overloaded and each function of the device needs to be wired separately.

Troubleshooting:

1. If the switch is plugged in and pressed and nothing happens, make sure the device's original switch is in the "on" position.
2. Remember, modifying battery-powered devices is a trial-and-error process. If at first it doesn't work, try another way!



Single-Switch Construction Diagrams and Photos

The following pages contain some ideas for single-switching devices constructed with "good junk" and "great stuff." The materials and construction process for each device are presented, along with a photo of each switch. If the pre-wired cords from *ALL ELECTRONICS* are used, omit the steps which describe wiring the plug.

HUG ME SWITCH

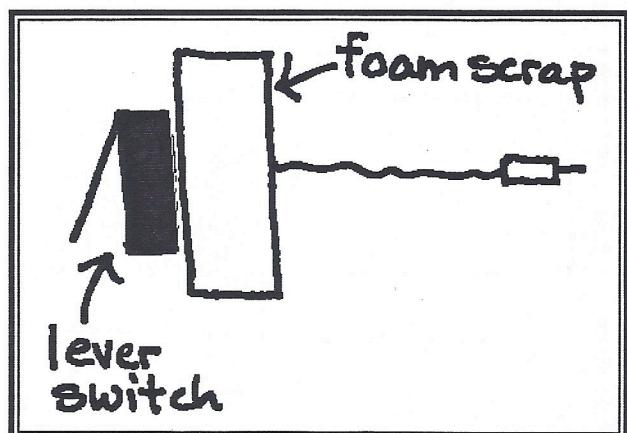
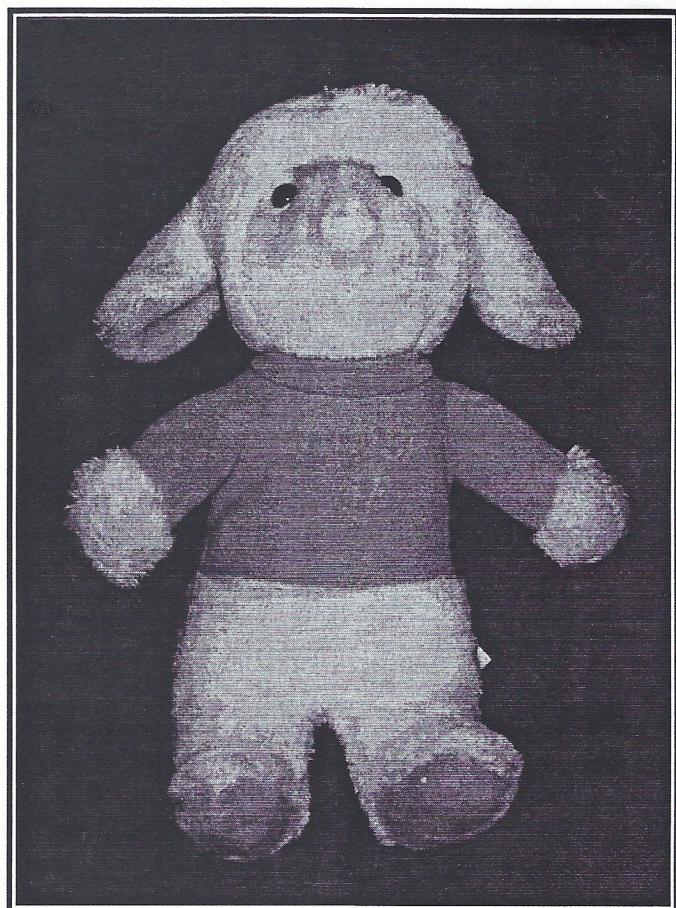
CHAPTER
1

Materials:

Stuffed animal or doll
Foam scraps for stuffing
Needle/thread
3 feet of 22 gauge "stereo" wire
 $\frac{1}{8}$ " 2-conductor phone plug
SPDT Lever Switch (RS #275-016)

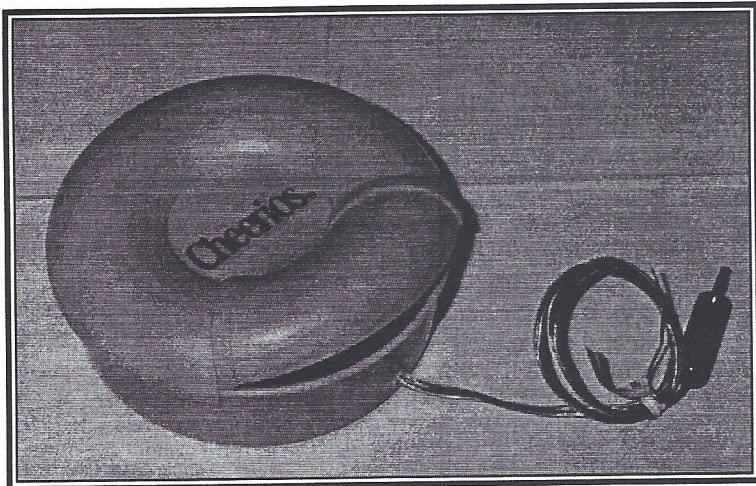
Process:

1. Wire plug.
2. Thread wire through a foam scrap approximately 2" square, and $\frac{1}{2}$ " thick.
3. Wire lever switch and solder or tape connections.
4. Make a slit in the back of the stuffed animal, and remove a "handful" of stuffing.
5. Cut small foam pieces to replace the removed stuffing.
6. Place the switch in the animal with the lever facing the animal's front, and the wire running out the back.
7. Begin to restuff the animal, working around the switch.
8. Use enough stuffing so that the animal is "fat" and the switch is held in an upright position.
9. Sew slit in back of animal.



▲ Wiring diagram for Hug Me Switch

CHEERIOS® CONTAINER SWITCH



Materials:

Cheerios® Snack Container

Soft-Feel Momentary Push Switch
(RS #275-1566)

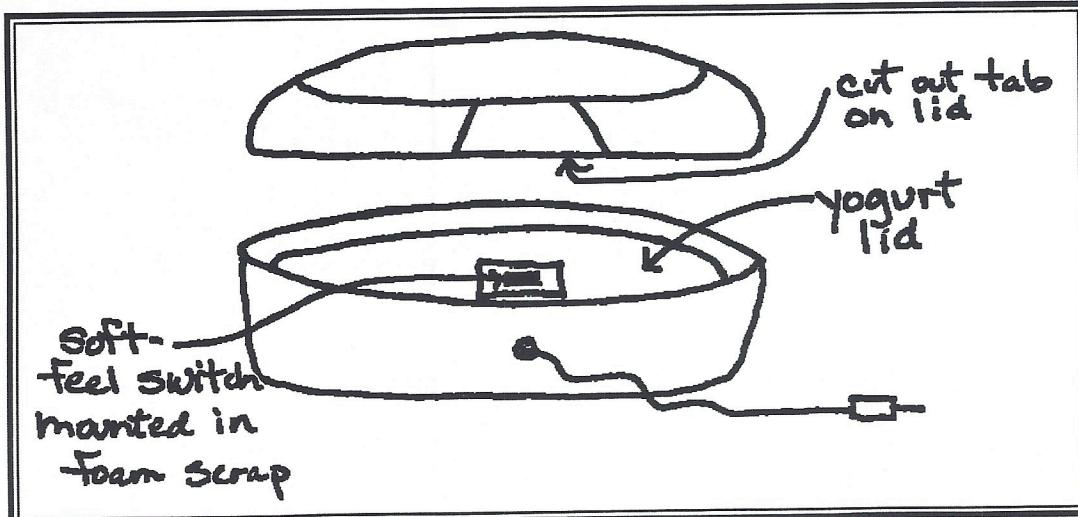
3 feet of 22 gauge "stereo" wire
 $\frac{1}{8}$ " 2-conductor phone plug

3 foam scraps approximately 1" thick,
and 2" square

Plastic lid from 16 oz. sour cream or
yogurt container

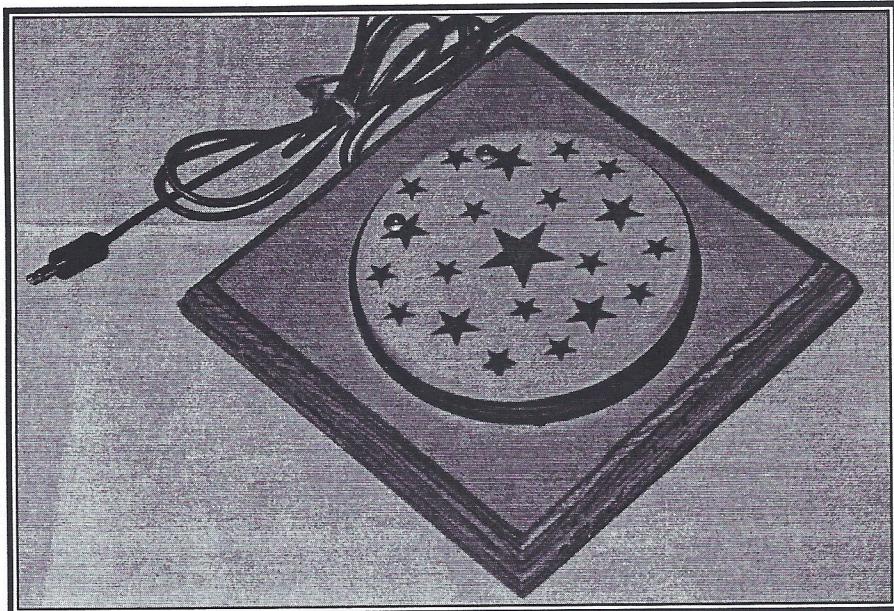
Process:

1. Wire plug end.
2. Remove lid from Cheerios container.
3. Make hole in Cheerios container about $\frac{1}{8}$ " from base in center of lid opening area.
4. Trim plastic lid to fit inside container; make hole in top of lid approximately $\frac{1}{8}$ " from edge of lid.
5. Make hole in side of lid beneath hole in top, and approximately $\frac{1}{8}$ " from bottom of lid.
6. Invert lid and place into Cheerios container.
7. Make hole in one foam scrap approximately $\frac{1}{4}$ " from edge of foam.
8. Feed wire through hole on side of container and plastic lid, then up through hole in top of plastic lid and hole in foam scrap.
9. Wire Soft-Feel Switch to end of wire, and solder connections.
10. Seat switch in foam in container, and place two foam scraps on either side of switch to keep it upright.
11. Trim foam scraps to fit.
12. Snap on Cheerios container lid.



▲ Wiring diagram for Cheerios® Container Switch.

PRESSURE FOAM PLATE SWITCH

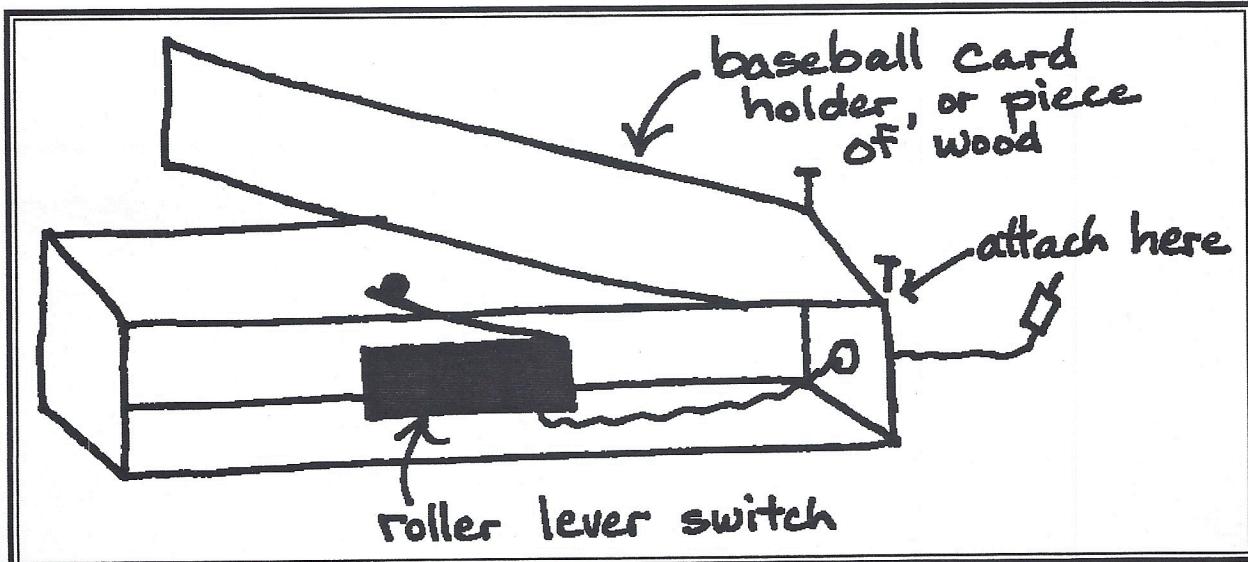


Materials:

- 1 Roller Lever Switch (RS #275-017)
- 1 piece of wood approximately 5" x 5" x $\frac{3}{4}$ "
- 1 3.5 mm ($\frac{1}{8}$ ") plug with cord (AE #CB-353)
- Hot glue and solder
- Flat plastic foam pad piece approximately 5" x 5"

Process:

1. Drill a hole in the center of the wooden base. The hole needs to be wide enough so the switch can be recessed into it, but should not be all the way through the board.
2. Drill a small hole in the side of the board to feed the cord through. The hole should be perpendicular to the hole drilled in step #1.
3. Feed the stripped ends of the cord through the small hole.
4. Solder the stripped ends of the cord to the terminals of the *Roller Lever Switch*.
5. Hot-glue the switch in the hole in the center of the wooden base.
6. Screw the top plate foam pad to the top. Only screw one end. Two or three small washers may be placed around the screws to achieve the right lever action.

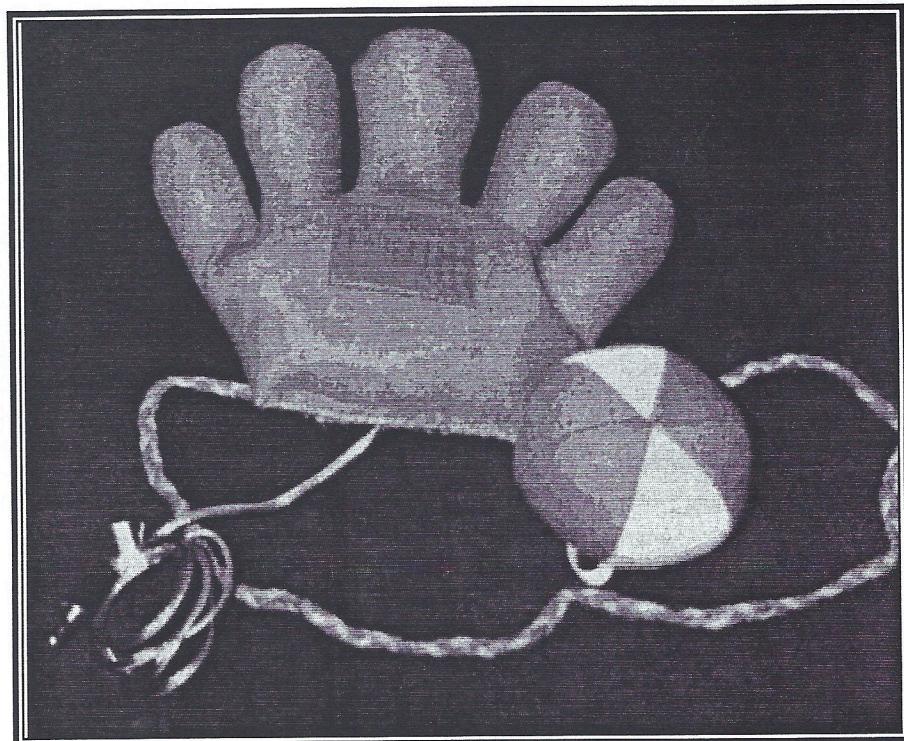


▲ Wiring diagram for Pressure Foam Plate Switch

BALL & GLOVE SWITCH

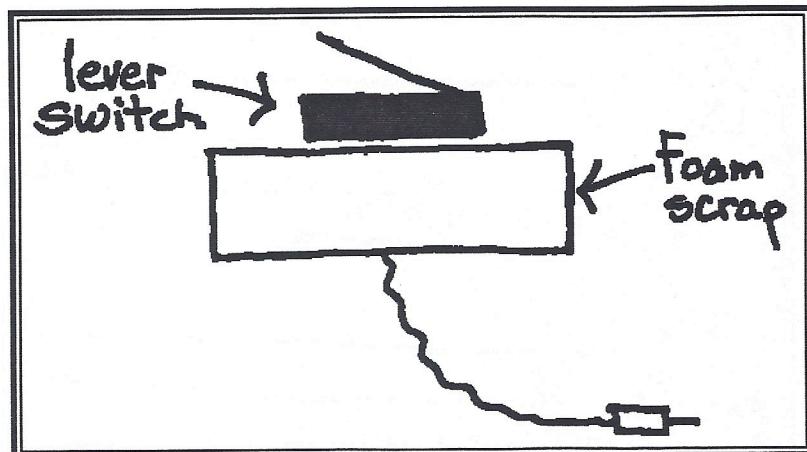
Materials:

Velcro™ Ball & Mitt Set
Foam scraps for stuffing
Needle/thread
12" of elastic $\frac{1}{4}$ " wide
3 feet of 22 gauge "stereo" wire
 $\frac{1}{8}$ " 2-conductor phone plug
SPDT Lever Switch
(RS #275016)
1 yard each of three colors of yarn



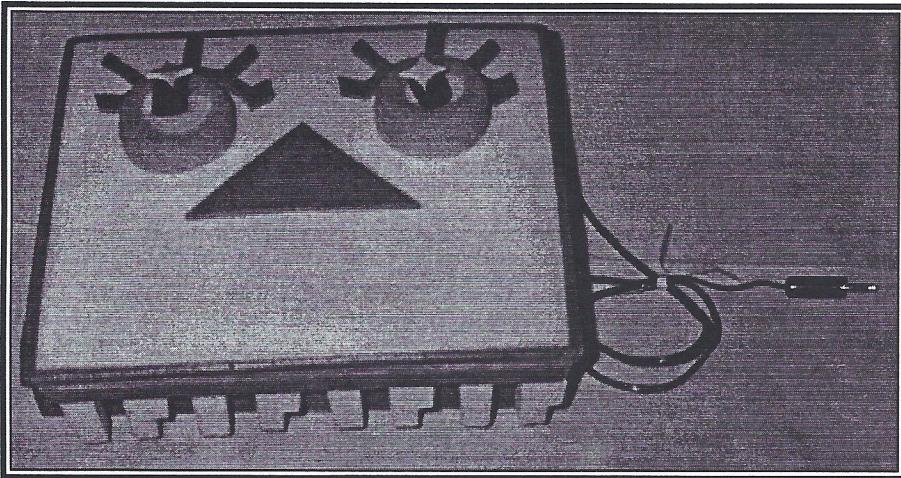
Process:

1. Wire plug.
2. Cut small foam pieces for stuffing in glove.
3. Stuff fingers of the glove to desired "fatness."
4. Wire the lever switch, soldering or taping connections.
5. Place the switch in the glove with the lever facing the palm of the glove, and the wire running out the glove opening.
6. Begin to stuff the glove, working around the switch.
7. Use enough stuffing so that the glove is "fat" and the switch is held in an upright position.
8. Sew opening in glove closed.



▲ Wiring diagram for Lever Switch insert in Ball and Glove Switch

MONSTER SWITCH

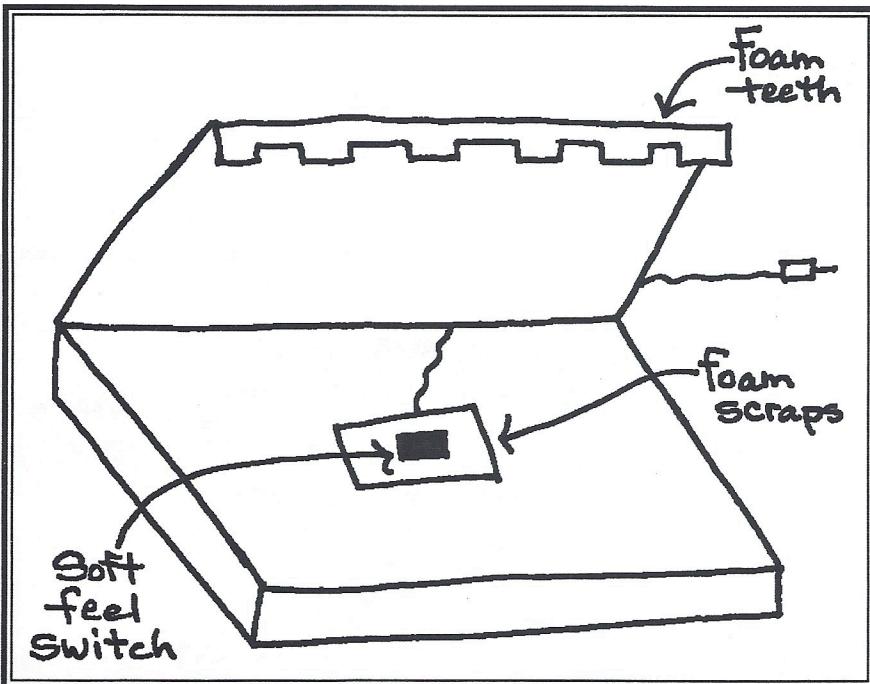


Materials:

- 3 feet of 22 gauge "stereo" wire
- 1/8" 2-conductor phone plug
- Soft-Feel Momentary Push Switch (RS #275-1566)
- Plastic box, perhaps an old VCR case, or a software program box (must have a hinged lid)
- Decorative foam sheets, pieces and scraps
- Thick piece of foam for "teeth"
- Colored tape

Process:

1. Wire plug.
2. Make hole in center of box bottom.
3. Thread wire through hole into box.
4. Make hole in several 1" square scraps of foam sheeting.
5. Thread wire through foam scraps.
6. Wire soft-feel switch, soldering or taping connections.
7. Seat switch in foam scraps.
8. Tape wire to bottom of box so switch sits flat.
9. Decorate the box with foam sheets and scraps — add a face, and some "teeth."



(Note: the "teeth" keep the lid of the box from resting on the switch surface).

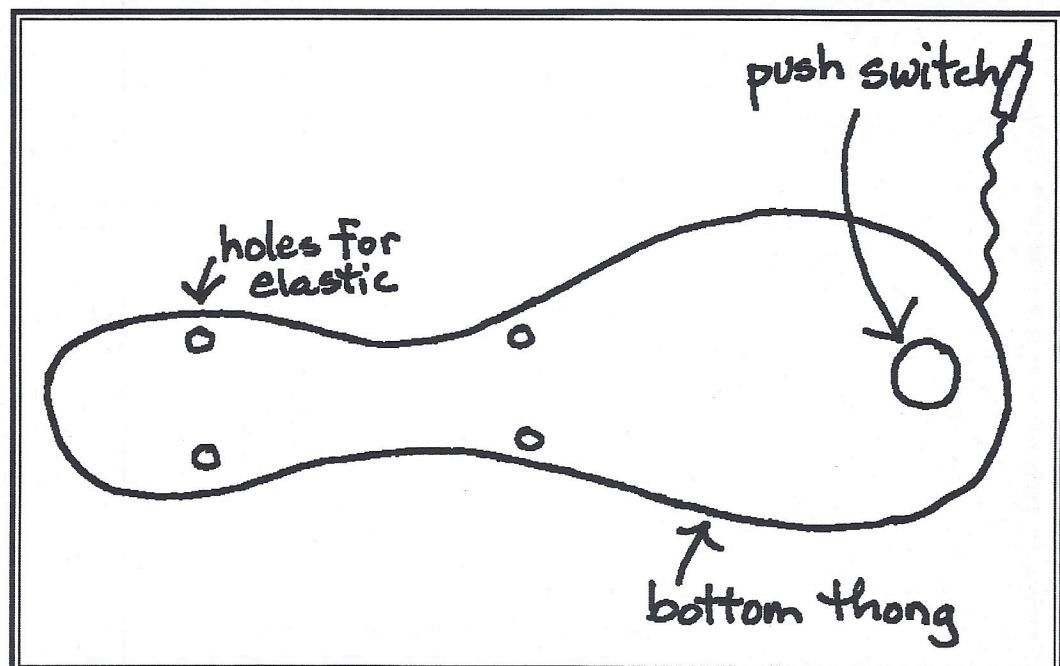
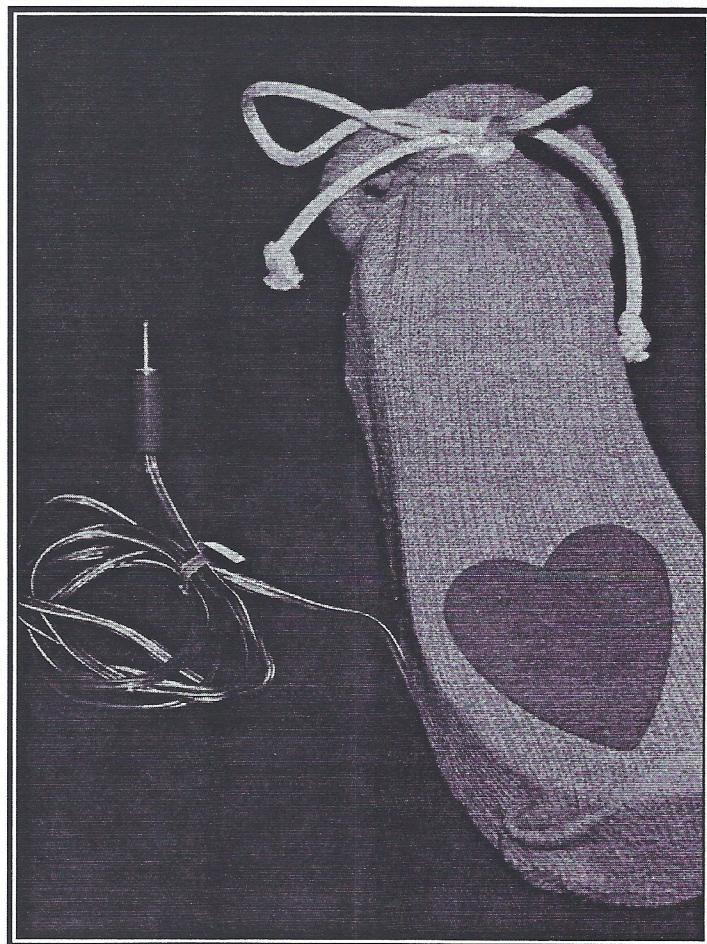
▲ Wiring diagram for Monster Switch

Materials:

Old sock
 Child-size pair of rubber thongs
 10" of elastic, $\frac{1}{4}$ " wide
 3 feet of 22 gauge "stereo" wire
 $\frac{1}{8}$ " 2-conductor phone plug
SPST Momentary Push Switch
 (RS #275-609)

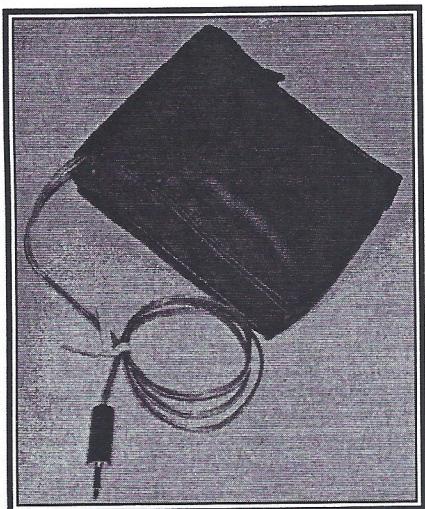
Process:

1. Wire plug.
2. Remove straps from both thongs.
3. Make hole in the center of the "foot part" of one thong.
4. Thread wire through the hole.
5. Wire push switch and solder or tape connections.
6. Seat switch in hole in thong.
7. Cut elastic into two 5" pieces, and thread through holes where thong straps were attached, placing the thongs together like a "sandwich."
8. Tie elastic.
9. Cut a slit in the toe of the sock and thread the plug end of the wire through.
10. Slide thongs into sock.
11. Sew slit in toe of sock.
12. Tie top of sock closed.



▲ Wiring diagram for Sock Switch

LITTLE GIRL'S PURSE SWITCH

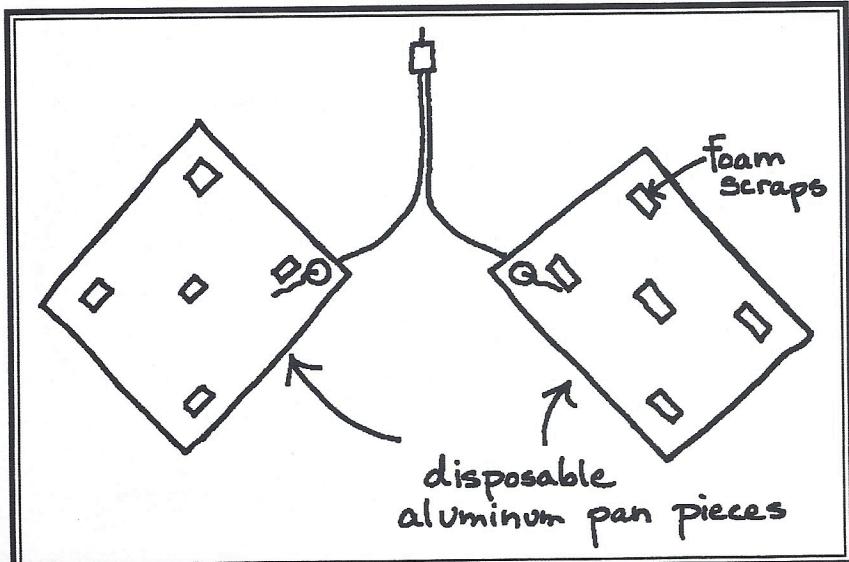


Materials:

Little girl's over-the-shoulder soft purse
Disposable aluminum pan pieces
3 feet of 22 gauge wire
 $\frac{1}{8}$ " 2-conductor phone plug
Foam scraps
Thin foam sheeting (disposable air conditioner filters work well)
Double-sided foam tape
Electrical tape
Plastic or cloth tape, or super glue

Process:

1. Wire phone plug.
2. Separate other end of wire about 4 inches, and strip 1" of plastic from each piece of wire.
3. Cut two aluminum pan pieces to be $\frac{1}{4}$ " smaller than the size of the purse.
4. Make a small hole in one corner of each pan piece.
5. Insert the stripped wire through the hole, pulling the wire through up to the plastic covering.
6. Attach stripped wire to each pan piece using electrical tape, making sure that it is securely fastened.
7. Cut ten small pieces of double-sided foam tape, approximately $\frac{1}{2}$ " square.
8. Place five pieces of foam tape on each pan piece, on the reverse side of the pan from the electrical tape.
9. Place the foam tape in each corner and the center of each pan piece.
10. Cut five small foam pieces slightly larger than the foam tape, and attach to the foam tape on one pan piece.
11. Place other pan piece on top of foam pieces to form a "sandwich," making sure that the foam pieces are sandwiched between the foam tape.



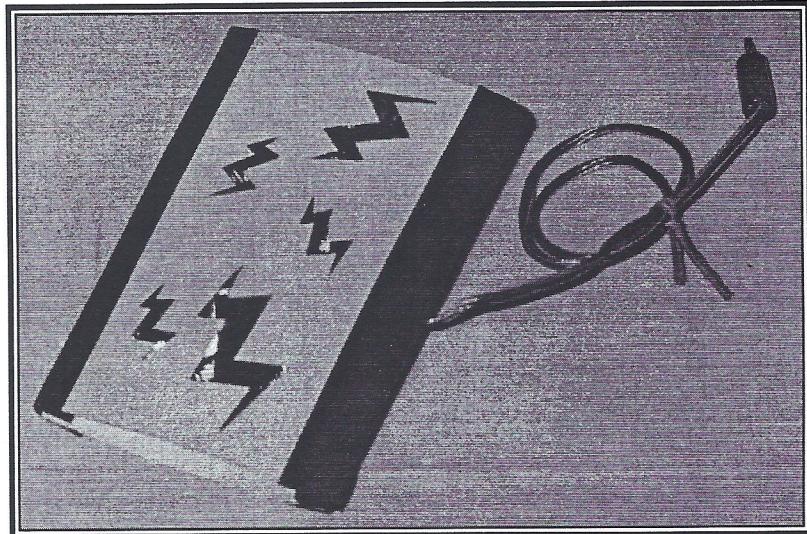
12. Wrap the "sandwich" in the foam sheeting, and trim to fit.
13. Slide the "sandwich" into the purse, with the wire extending from a corner of the purse.
14. Place additional foam scraps on each side of the "sandwich" for padding.
15. Seal the purse opening with super glue or with plastic or cloth tape.

▲ Wiring diagram for Little Girl's Purse Switch

VERTICAL BLIND SWITCH

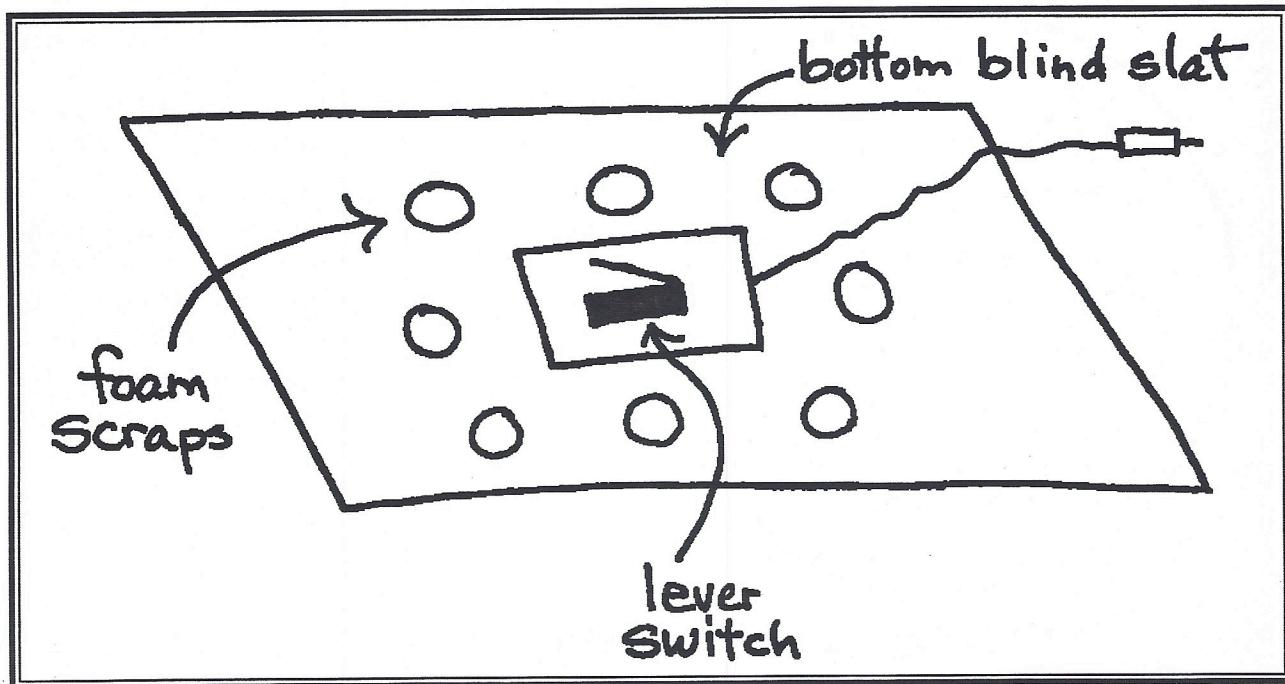
Materials:

2 (6") pieces vertical blind material
1 foot of foam window weather-stripping $\frac{1}{4}$ " wide
Foam scraps
Double-sided foam tape pieces
 $\frac{1}{8}$ " 2-conductor phone plug
3 feet of 22 gauge "stereo" wire
SPDT Lever Switch (RS #275-016)
Electrical Tape



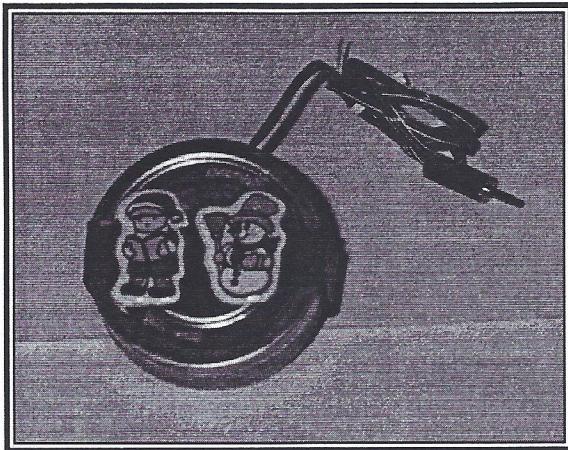
Process:

1. Wire plug.
2. Wire lever switch, soldering or taping connections.
3. Mount lever switch in center of one piece of vertical blind material, concave side up, using foam sticky tape.
4. Bring wire out side of vertical blind material.
5. Place small pieces of foam on either side of lever switch to keep it upright.
6. Hot-glue foam strips on either side of vertical blind material.
7. Place hot-glue on top of foam strips and then place other piece of vertical blind material onto hot-glue, like a "sandwich."
8. Use electrical tape to cover the foam/glue on the vertical blind material.



▲ Construction diagram for Vertical Blind Switch

SMALL BOX SWITCH



Materials:

Any type of small, lidded box (plastic, cardboard, or metal)

Lever Switch or Soft-Feel Momentary switch (depending on the height of the box — shorter boxes = lever switch; taller boxes = soft-feel switch)

3 feet of 22 gauge wire

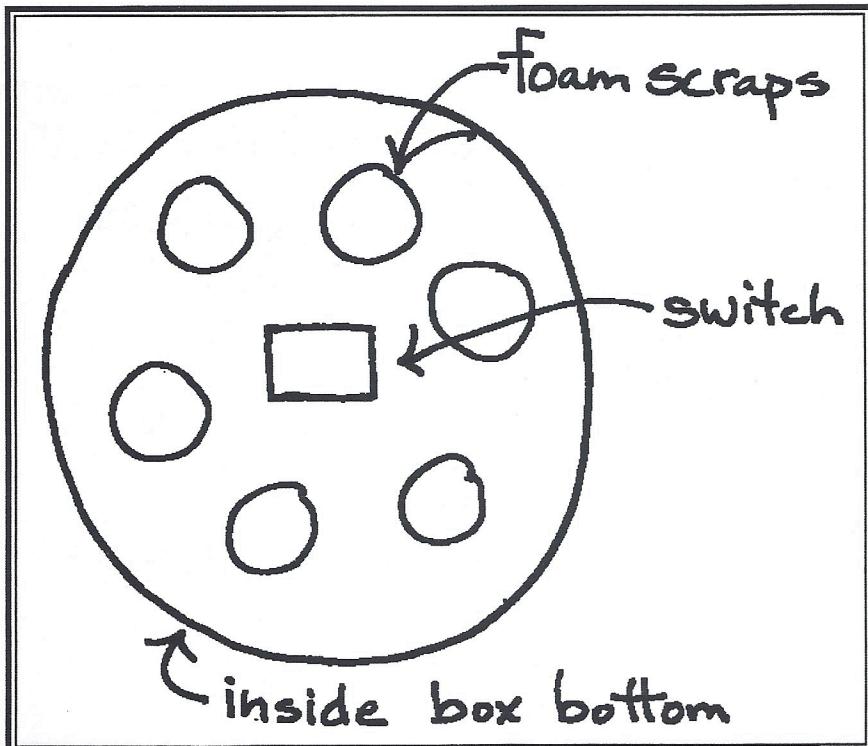
1/8" 2-conductor phone plug

Foam scraps

Plastic or cloth tape, ribbon, or elastic (for "hinges")

Process:

1. Make a hole in the bottom or side of the box for the wire to pass through. (Hint: When the hole is on the side of the box, the switch is more stable on the table surface.)
2. Decide how to "hinge" the box, and if using elastic or ribbon, make the appropriate holes in the top and sides of box for the "hinges."
3. Wire the plug.
4. Insert the end of the wire through the hole in the side of the box, from outside to inside the box.
5. Make a hole in a foam scrap, and feed the wire through the foam. This foam piece will house the switch and keep it stable in the switch housing.
6. Split and strip the ends of the wire approximately 1", and wire the switch.
7. Seat the switch in the foam scrap until it is stable and will not tip over.



8. Use additional foam scraps to fill the box around and underneath the switch.
9. Make sure that there is enough foam to permit the switch to be depressed and then return to the "off" position.
10. Place some foam scraps around the top of the switch to ensure that the lid of the box will spring up once it is pressed and released.
11. Create the "hinges" for the box from tape, ribbon, or elastic.

▲ Construction diagram for Small Box Switch

ADDRESS BOOK SWITCH

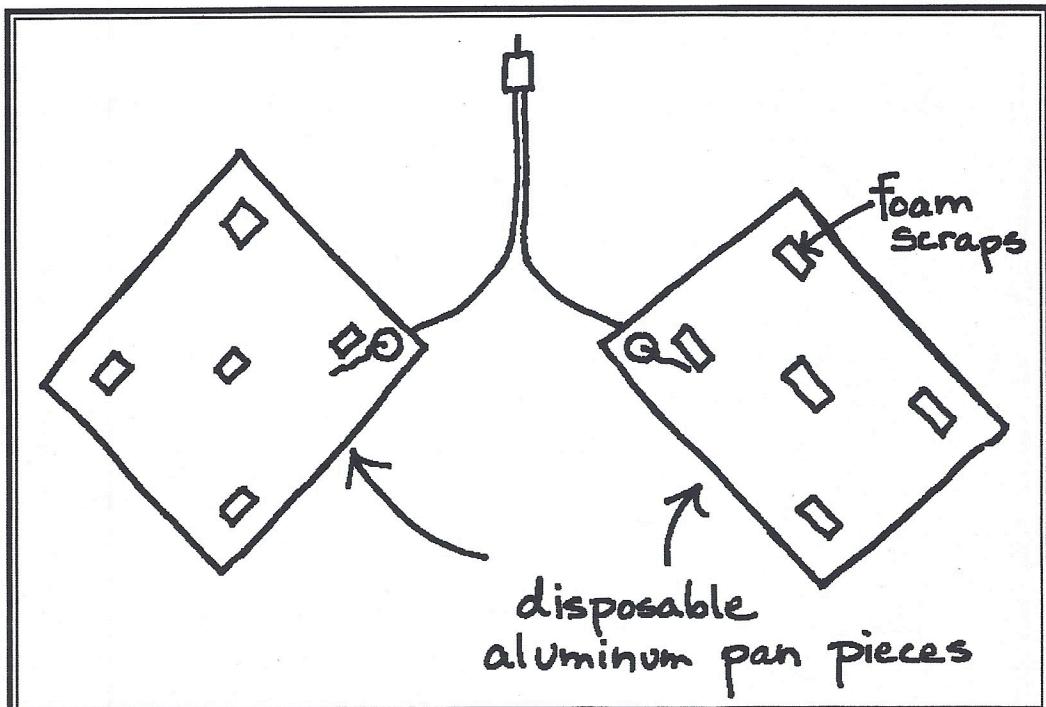
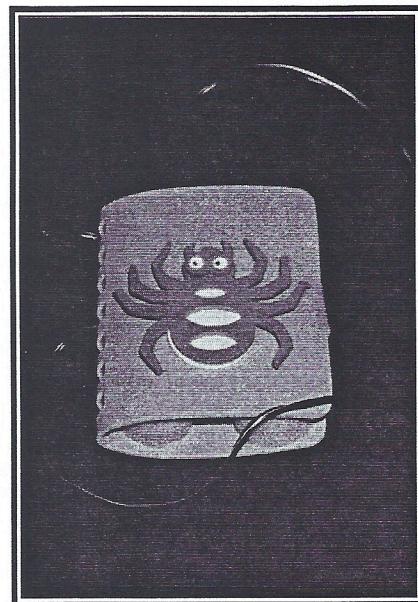
Materials:

Soft address book
Disposable aluminum pan pieces
 $\frac{1}{8}$ " 2-conductor phone plug
Double-sided foam tape

3 feet of 22 gauge wire
Foam scraps
Electrical tape
Plastic or cloth tape

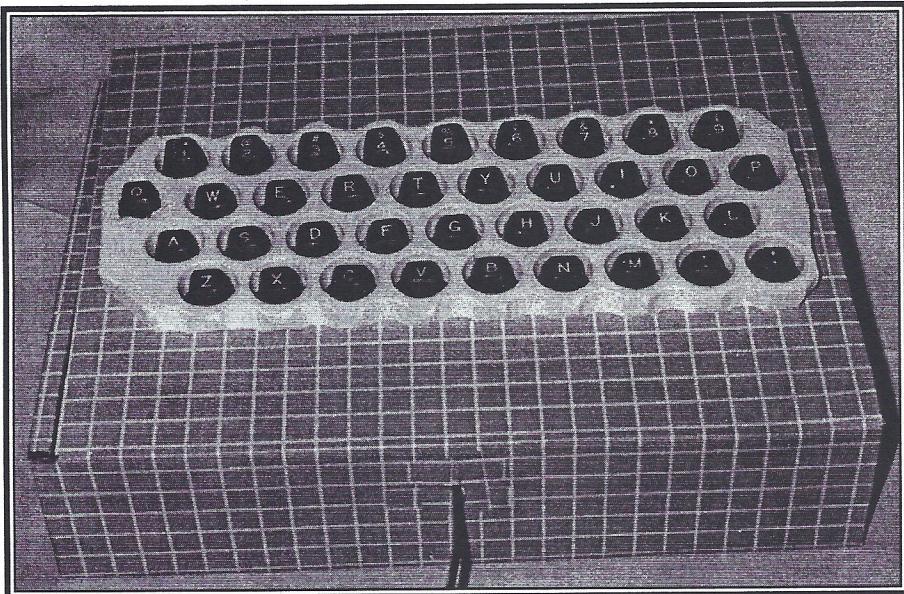
Process:

1. Wire phone plug.
2. Separate other end of wire about 4 inches, and strip 1" of plastic from each piece of wire.
3. Cut two aluminum pan pieces to be $\frac{1}{4}$ " smaller than the size of the book.
4. Make a small hole in one corner of each pan piece.
5. Insert the stripped wire through the hole, pulling the wire through up to the plastic covering.
6. Attach stripped wire to each pan piece using electrical tape, making sure that it is securely fastened.
7. Cut ten small pieces of double-sided foam tape, approximately $\frac{1}{2}$ " square.
8. Place five pieces of foam tape on each pan piece, on the reverse side of the pan from the electrical tape.
9. Place the foam tape in each corner and the center of each pan piece.
10. Cut five small foam pieces slightly larger than the foam tape, and attach to the foam tape on one pan piece.
11. Place other pan piece on top of foam pieces to form a "sandwich," making sure that the foam pieces are sandwiched between the foam tape.
12. Attach the "sandwich" to the inside of the book with foam tape, with the wire extending from a corner of the book.
13. Seal the sides of the book with plastic or cloth tape.



▲ Wiring diagram for Address Book Switch

KEYBOARD SWITCH



Materials:

Cardboard box with hinged lid (approximately 13" long; 10" wide; and 3" deep)

Old typewriter key covers

Foam scraps, approximately matching length/height of box

Foam sheet with 1" holes punched in rows

3 feet of 22 gauge "stereo" wire

1/8" 2-conductor Phone Plug

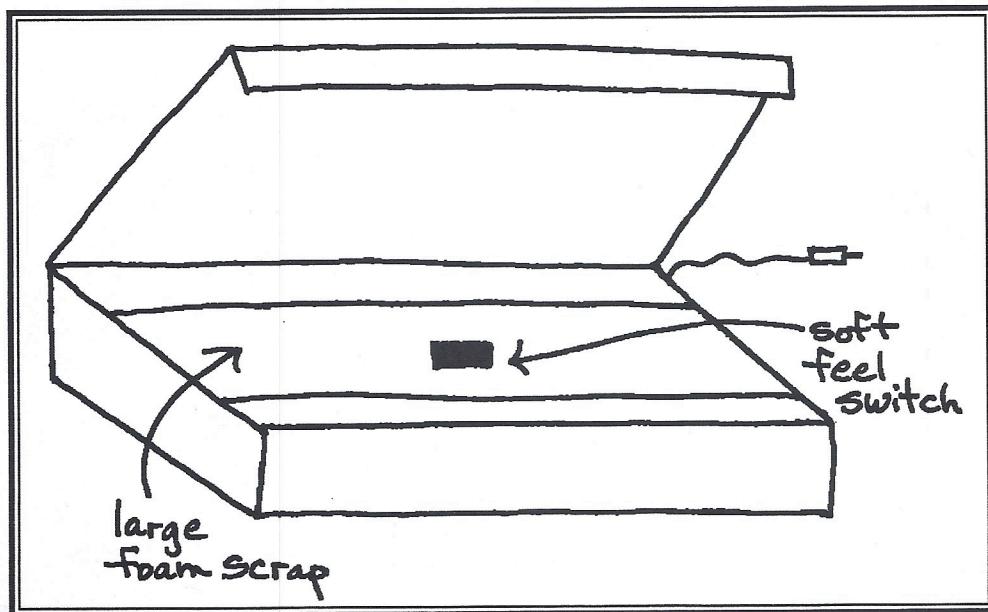
Soft-feel Momentary Push Switch (RS #275-1566)

Contact Paper

Process:

1. Wire plug.
2. Make hole in center of back of box, approximately 2" from bottom.
3. Thread wire through hole in box so that plug is on the outside of the box.
4. Hot-glue foam piece to center of box bottom.
5. Cut square hole in top of center of foam piece approximately 2" square and 1" deep.
6. Cut slit in foam piece from square to back of box.
7. Make hole in square foam piece and thread wire through.
8. Wire soft-feel switch and solder or tape connections.
9. Seat soft-feel switch in the cut-out square, and place wire in the cut-out slit in the top of the foam.

10. Adjust so that box lid does not rest on top of switch.

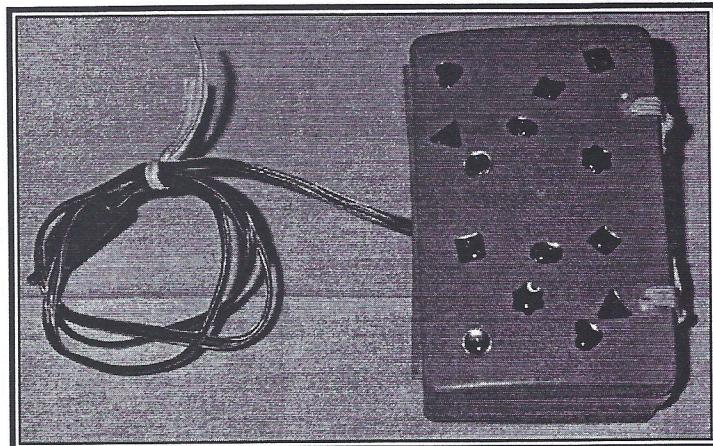


▲ Construction diagram for Keyboard Switch

SOAP DISH SWITCH

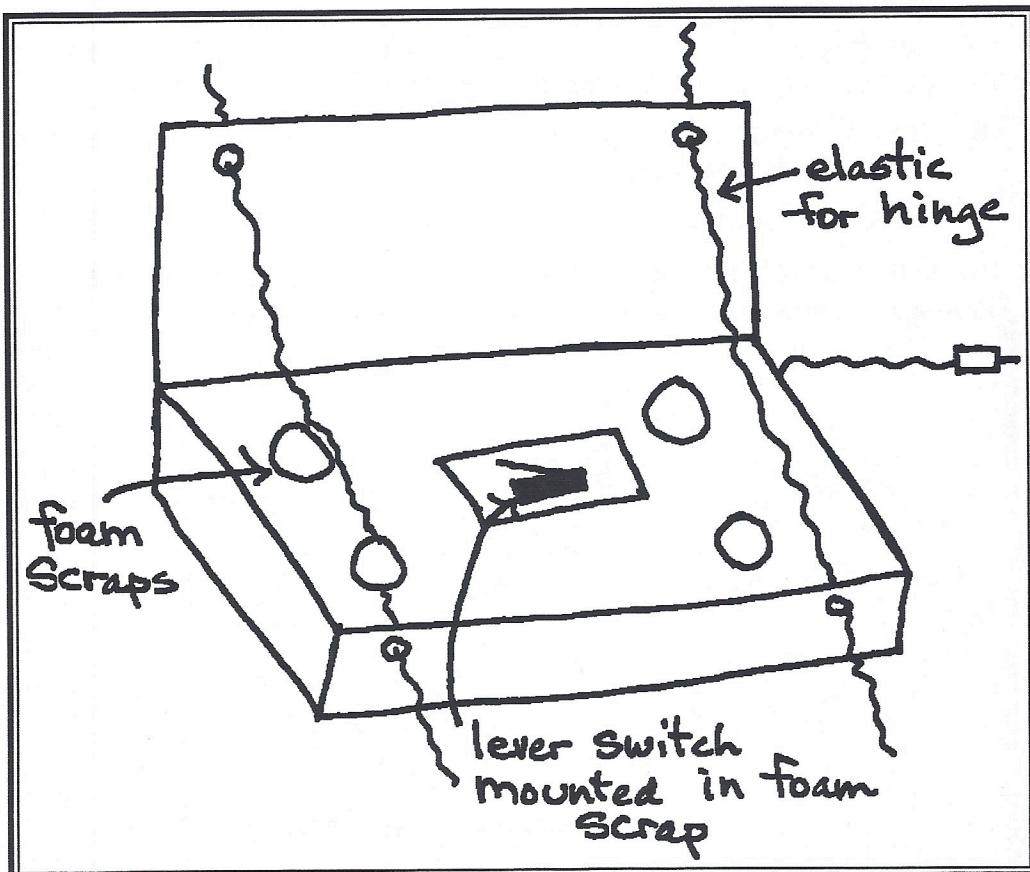
Materials:

Plastic soap dish
1/8" 2-conductor phone plug
3 feet of 22 gauge "stereo" wire
SPDT Lever Switch (RS #275-016)
10 inches, 1/8" elastic
3 foam scraps, approximately 1 1/2" tall and 2" square



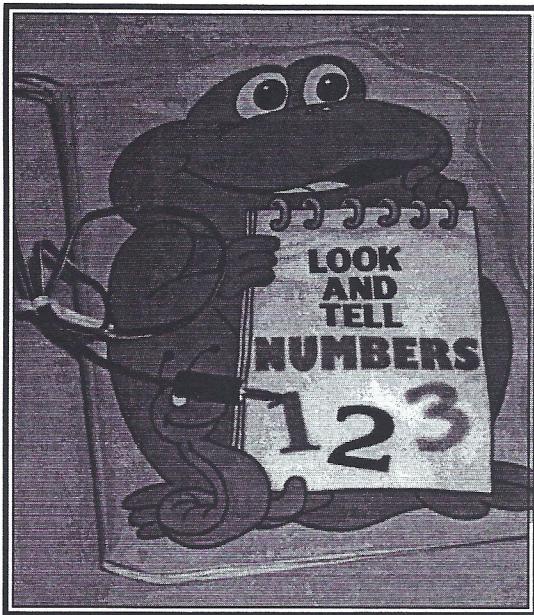
Process:

1. Wire plug.
2. Make five holes in soap dish: one in center back of soap dish; two on front of lid top, approximately 3/4" from either edge; two on front panel of dish.
3. Make hole in center of one foam scrap.
4. Thread wire through hole in back of dish and hole in center of foam.
5. Wire lever switch and solder or tape connections.
6. Seat switch in foam piece and attach foam piece to inside bottom surface of soap dish using hot-glue.
7. Place two pieces of foam diagonally on either side of switch to hold top of soap dish above surface of lever switch.
8. Cut elastic in half, making two 5" lengths.
9. Thread elastic through holes on front side and lid of dish to form a hinge.
10. Tie elastic loosely, making sure that dish lid is held above lever switch surface.
11. Adjust elastic for appropriate "hinge strength."



▲ Construction diagram for Soap Dish Switch

PADDED PLASTIC BOOK SWITCH

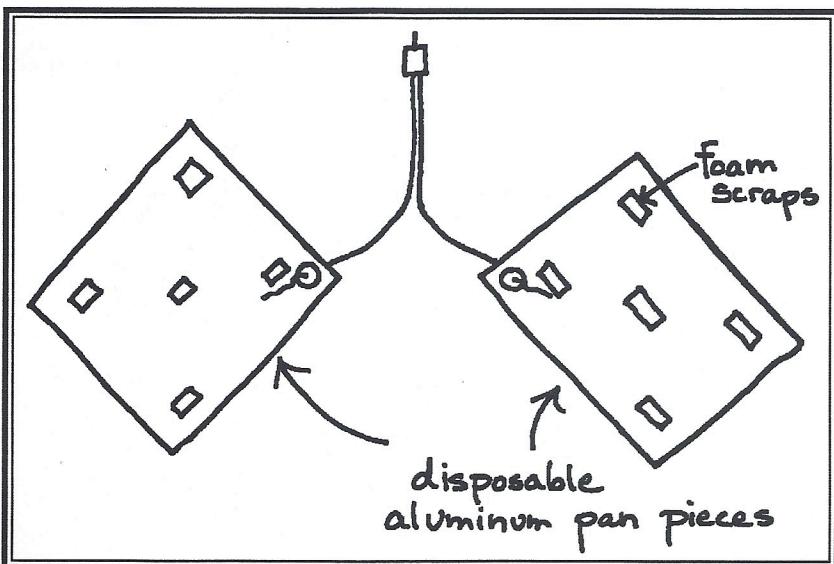


Materials:

Child's washable plastic padded book
Disposable aluminum pan pieces
3 feet of 22 gauge wire
 $\frac{1}{8}$ " 2-conductor phone plug
Foam scraps
Double-sided foam tape
Electrical tape
Plastic or cloth tape

Process:

1. Wire phone plug.
2. Separate other end of wire about 4 inches, and strip 1" of plastic from each piece of wire.
3. Cut two aluminum pan pieces to be $\frac{1}{2}$ " smaller than the size of the book.
4. Make a small hole in one corner of each pan piece.
5. Insert the stripped wire through the hole, pulling the wire through up to the plastic covering.
6. Attach stripped wire to each pan piece using electrical tape, making sure that it is securely fastened.
7. Cut at least ten small pieces of double-sided foam tape, approximately $\frac{1}{2}$ " square. (If the book is large, you will need additional foam tape pieces.)
8. Place one-half of the pieces of foam tape on each pan piece, on the reverse side of the pan from the electrical tape.
9. Place the foam tape in each corner and the center of each pan piece.
10. Cut at least five small foam pieces slightly larger than the foam tape, and attach to the foam tape on one pan piece (if using more than ten pieces of foam tape, more foam pieces will need to be cut).



11. Place other pan piece on top of foam pieces to form a "sandwich," making sure that the foam pieces are sandwiched between the foam tape.
12. Attach the "sandwich" to the inside of the book with foam tape, with the wire extending from a corner of the book.
13. Seal the corners of the book with plastic or cloth tape.

▲ Wiring diagram for Padded Plastic Book Switch

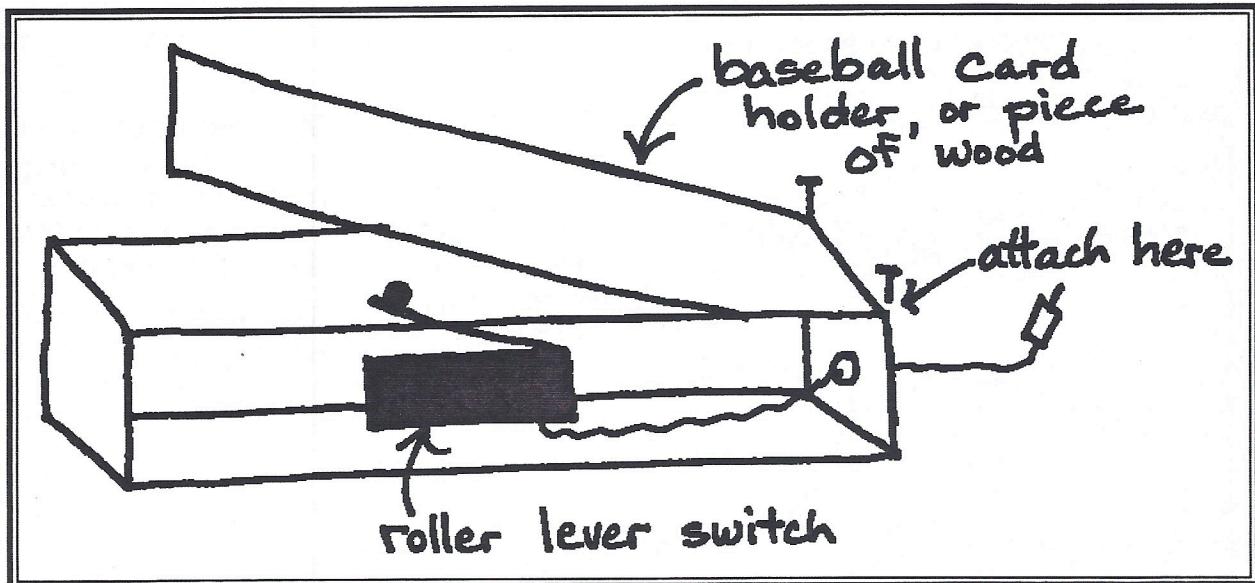
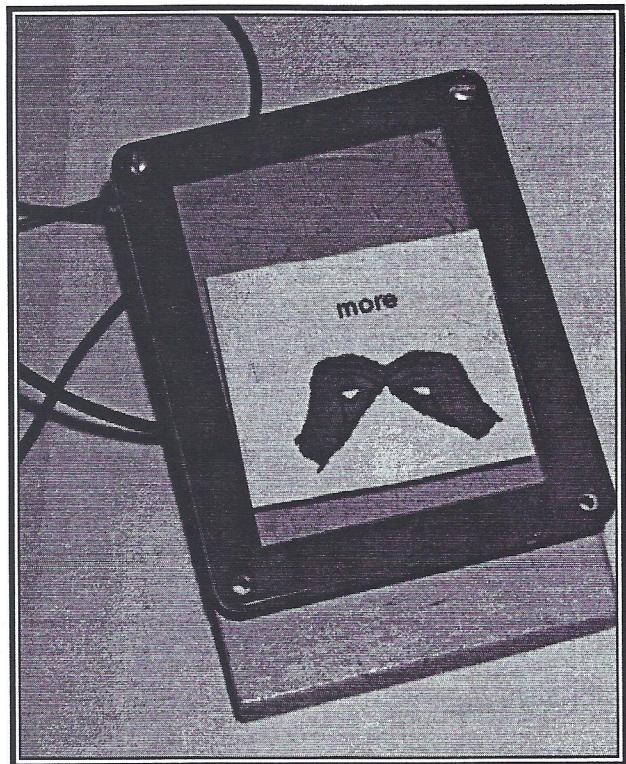
BASEBALL CARD HOLDER SWITCH

Materials:

- 1 Hard baseball card holder (type with 4 screws in corners)
- 1 Piece of wood (about $\frac{1}{2}$ " larger than card holder $\times \frac{3}{4}$ ")
- 1 ($\frac{1}{8}$ ") plug to stripped ends – 4 ft. (RS #42-2434)
- 1 *Roller Lever Switch* (RS #275-017)
- 2 Screws to screw baseball card holder to wood
- Hot-glue and solder
- 6 Washers ($\frac{5}{32}$ " or $\frac{3}{16}$ " work well)
- Communication symbols, picture, bright paper, etc.

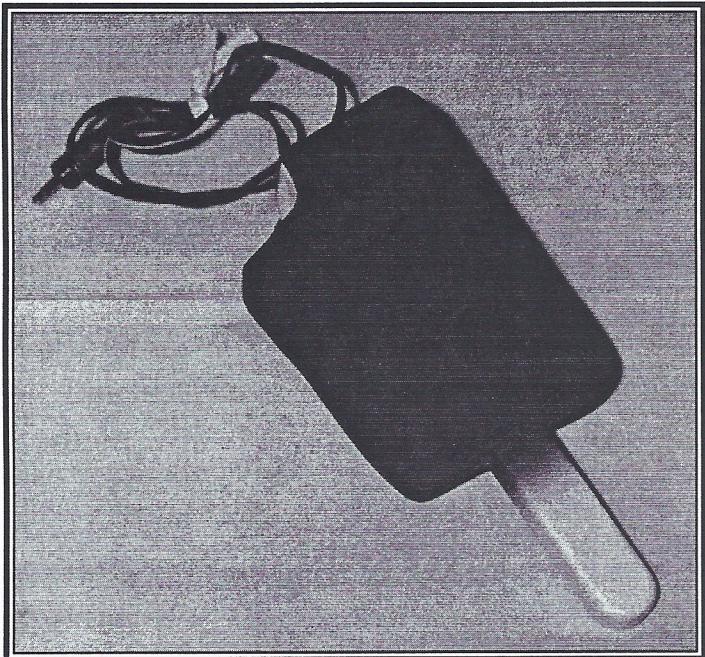
Process:

1. Drill a hole in the center of the wooden base. The hole needs to be wide enough so the switch can be recessed into it, but should not be all the way through the board.
2. Drill a small hole in the side of the board to feed the cord through. The hole should end up in the hole that was drilled in step #1.
3. Feed the stripped ends of the cord through the small hole.
4. Wire the switch.
5. Hot-glue the switch in the hole in the center of the wooden base.
6. Screw the top plate of the baseball card holder to the top. Only screw one end. Two or three small washers may be placed around the screws to achieve the right lever action.



▲ Construction diagram for Baseball Card Holder Switch

PLASTIC DOG OR CAT TOY SWITCH

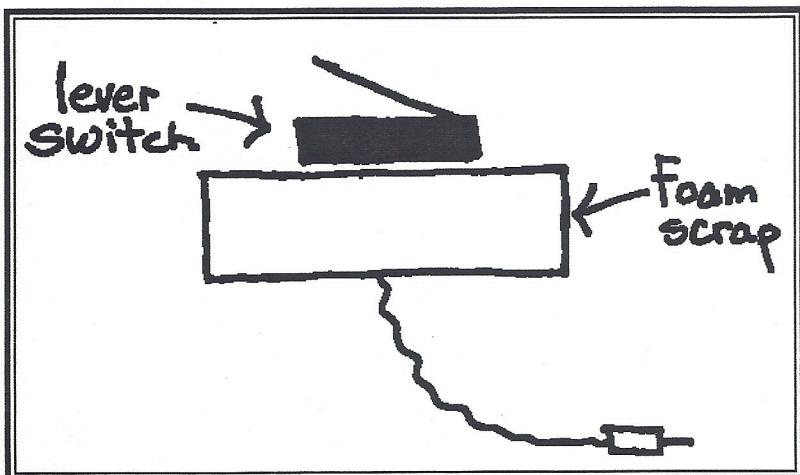


Materials:

Soft plastic dog or cat squeeze toy
Lever switch
3 feet of 22 gauge wire
 $\frac{1}{8}$ " 2-conductor phone plug
Foam scraps
Plastic or cloth tape

Process:

1. Cut a slit in the bottom of the toy that is long enough to permit you access to the inside of the toy.
2. Wire plug.
3. Make a hole in the side of the toy, large enough to accommodate the wire.
4. Insert the wire through the hole.
5. Cut a slit in the center of a 2" long, 1" wide, foam scrap, making the slit approximately $\frac{3}{4}$ " in length.
6. Strip ends of wire approximately 1", and wire lever switch.
7. Insert lever switch into slit in the foam scrap until it is secure and remains in an upright position.
8. Place foam scrap with lever switch inside the center of the toy.
9. Use additional foam scraps for "padding" around the switch and inside the toy, making sure the toy is well packed with foam scraps.



10. Make sure there is enough "give" in the foam scrap padding to permit the lever switch to be depressed and then spring back to the "off" position.
11. Seal the slit in the bottom of the toy with plastic or cloth tape.

▲ Switch housing diagram for Plastic Dog or Cat Toy Switch

SANDWICH SWITCH

Materials:

Plastic "play food": 2 slices bread and sandwich "filler" (meat, cheese, lettuce, tomato, peanut butter, jelly, etc.)

Disposable aluminum pan pieces

3 feet of 22 gauge wire

1/8" 2-conductor phone plug

Foam scraps

Double-sided foam tape

Electrical tape

Super glue, or *PVC Pipe Glue*

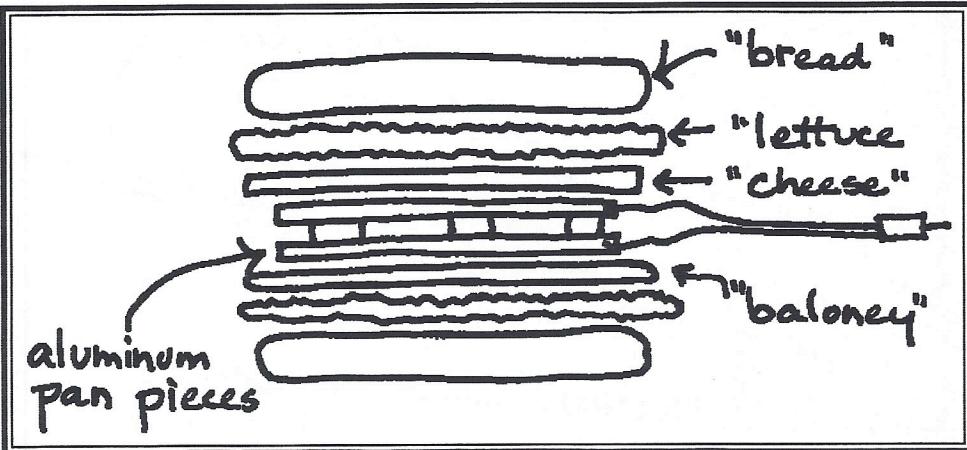


Fishing line

Darning needle

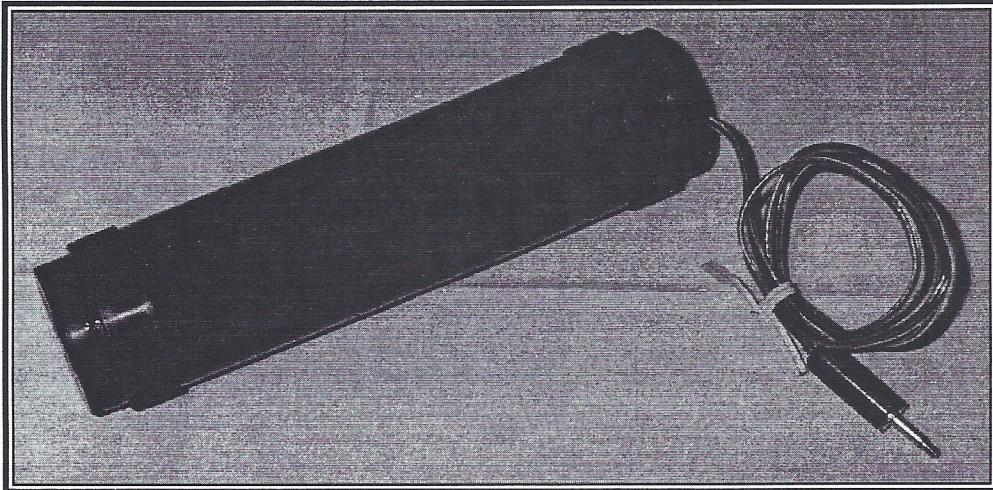
Process:

1. Wire the plug.
2. Separate other end of wire about 4 inches, and strip 1" of plastic from each piece of wire.
3. Cut two aluminum pan pieces to be 1/2" smaller than the sandwich "filler" pieces.
4. Make a small hole in one corner of each pan piece.
5. Insert the stripped wire through the hole, pulling the wire through up to the plastic covering.
6. Attach stripped wire to each pan piece using electrical tape, making sure that it is securely fastened.
7. Cut at least ten small pieces of double-sided foam tape, approximately 1/2" square.
8. Place one-half of the pieces of foam tape on each pan piece, on the reverse side of the pan from the electrical tape.
9. Place the foam tape in each corner and the center of each pan piece.
10. Cut five small foam pieces slightly larger than the foam tape, and attach to the foam tape on one pan piece.
11. Place other pan piece on top of foam pieces to form a "sandwich," making sure that the foam pieces are sandwiched between the foam tape.
12. Attach the metal "sandwich" to the sandwich "stuffings" with *PVC Pipe Glue* or super glue.
13. Attach the plastic bread pieces to the sandwich "stuffing" using glue.
14. To insure that the sandwich does not come apart, use a long darning needle, threaded with fishing line, to "sew" the sandwich together at the corners.



▲ Construction diagram for Sandwich Switch

PLASTIC CYLINDER SQUEEZE SWITCH



Materials:

Pliable plastic tubing,
approximately 6" long
and 1½" in diameter

Thin foam sheeting
(disposable air
conditioner filters
work well)

Foam scrap,
approximately 3" long,
2" wide, and 1" thick

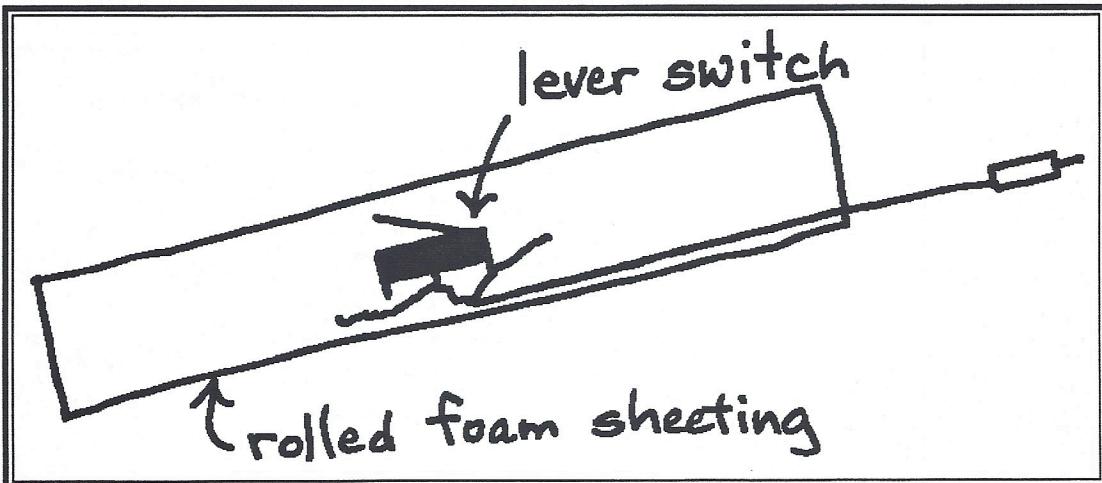
Lever switch

3 feet of 22 gauge wire
1/8" 2-conductor phone plug

2 plastic or metal caps to seal the ends of
the tube
Plastic tape or super glue

Process:

1. Wire the plug.
2. Make a hole in the center of one of the metal or plastic caps, and feed end of wire through hole.
3. Cut a slit in the center of the foam scrap approximately ¾" in length.
4. Strip ends of wire approximately 1", and wire lever switch.
5. Insert lever switch into slit in the foam scrap until it is secure and remains in an upright position.
6. Place foam scrap with lever switch in center of foam sheeting, and roll foam sheeting around the foam scrap and switch.
7. Make sure you don't roll the sheeting too tightly, or the lever switch will be depressed in the "on" position.
8. Slide foam roll into plastic tube.
9. Secure caps on both ends of the tube with glue or tape.

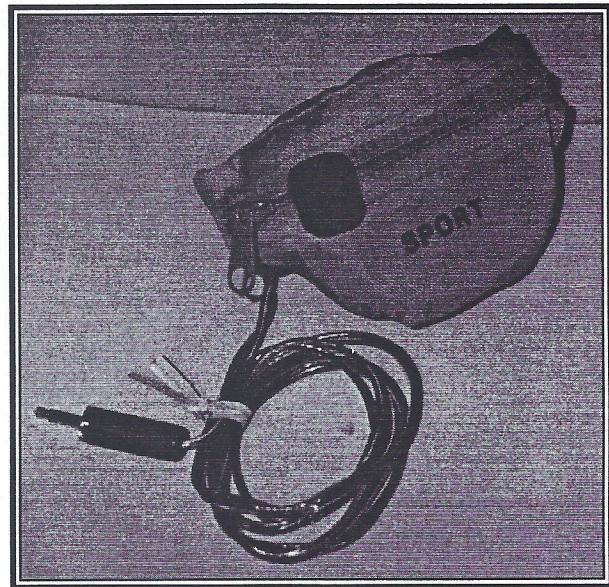


▲ Construction diagram for Plastic Cylinder Squeeze Switch

ZIPPER COIN PURSE SWITCH

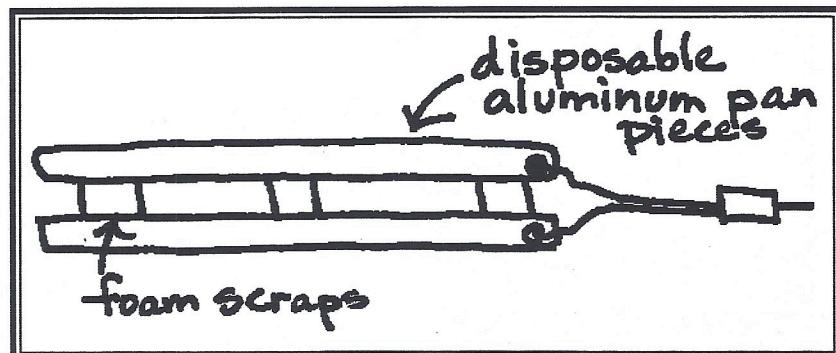
Materials:

Any type of zipper coin purse
 Disposable aluminum pan pieces
 3 feet of 22 gauge wire
 1/8" 2-conductor phone plug
 Foam scraps
 Double-sided foam tape
 Thin foam sheet (disposable air conditioner filters work well)
 Electrical tape



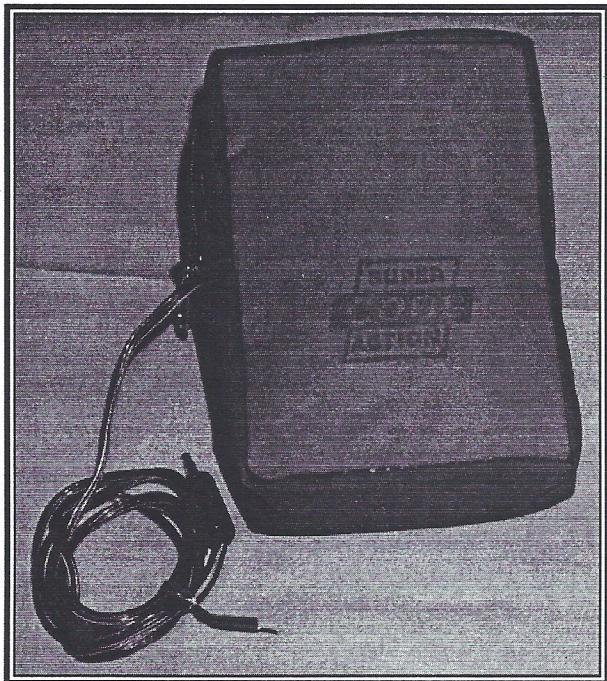
Process:

1. Wire phone plug.
2. Separate other end of wire about 4 inches, and strip 1" of plastic from each piece of wire.
3. Cut two aluminum pan pieces to be 1/4" smaller than the size of the coin purse.
4. Make a small hole in one corner of each pan piece.
5. Insert the stripped wire through the hole, pulling the wire through up to the plastic covering.
6. Attach stripped wire to each pan piece using electrical tape, making sure that it is securely fastened.
7. Cut ten small pieces of double-sided foam tape, approximately 1/2" square.
8. Place five pieces of foam tape on each pan piece, on the reverse side of the pan from the electrical tape.
9. Place the foam tape in each corner and the center of each pan piece.
10. Cut five small foam pieces slightly larger than the foam tape, and attach to the foam tape on one pan piece.
11. Place other pan piece on top of foam pieces to form a "sandwich," making sure that the foam pieces are sandwiched between the foam tape.
12. Wrap the "sandwich" in the thin sheet of foam, and trim foam to fit.
13. Slide the "sandwich" into the coin purse, with the wire extending from the end of the zipper enclosure.
14. Zip shut.
15. To be sure that the coin purse will not be unzipped by the user, place a small amount of super glue on the zipper teeth before zipping the coin purse shut.



▲ Construction diagram for Zipper Coin Purse Switch

JUICE BOX COVER SWITCH

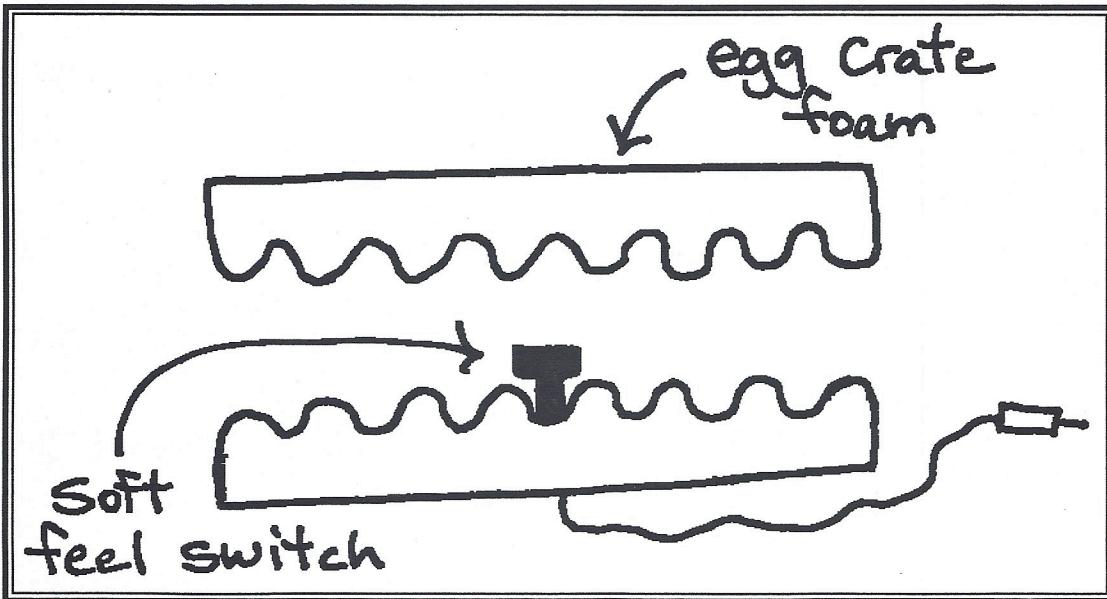


Materials:

- 1 Insulated juice box cover with zipper closure
- 2 Egg-crate foam pieces the size of the juice box cover
- 1 Soft-Feel Momentary Switch
- 3 feet of 22 gauge wire
- 1/8" 2-conductor phone plug

Process:

1. Cut 2 pieces of egg-crate foam to match the size of the juice box cover.
2. Make a hole in the center of one piece of foam, making sure that you make the hole in one of the convex "bumps" of the foam.
3. Wire the plug.
4. Feed wire through the hole in foam from smooth side of foam to "bumpy" side.
5. Split and strip wire approximately 1", and wire soft-feel switch.
6. After the switch is wired, slide switch through hole in foam, making sure that the switch is secure inside the foam, and remains upright.
7. Place other piece of foam on top of switch, adjusting the fit so the egg-crate pieces fit together smoothly and make a foam "sandwich."
8. Slide foam sandwich into the juice container with wire emerging at the corner of the container where the zipper closes.
9. Zip the container closed.
10. To be sure that the container will not be unzipped by the user, place a small amount of super glue on the zipper teeth before zipping the container shut.

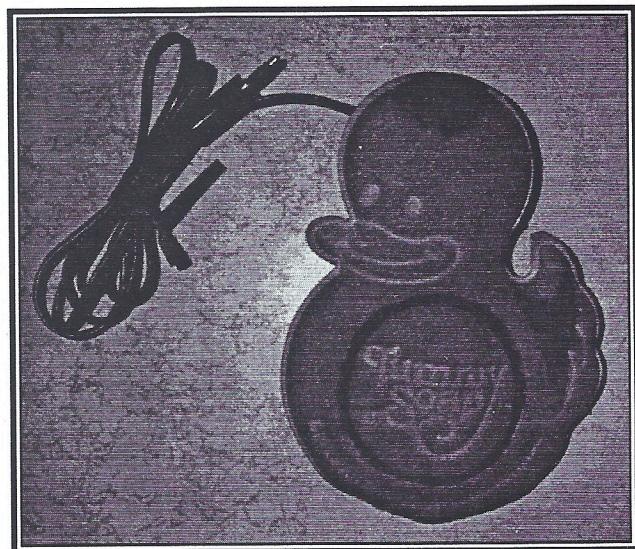


▲ Construction diagram for Juice Box Cover Switch

TUMMY SOAP SPONGE SWITCH

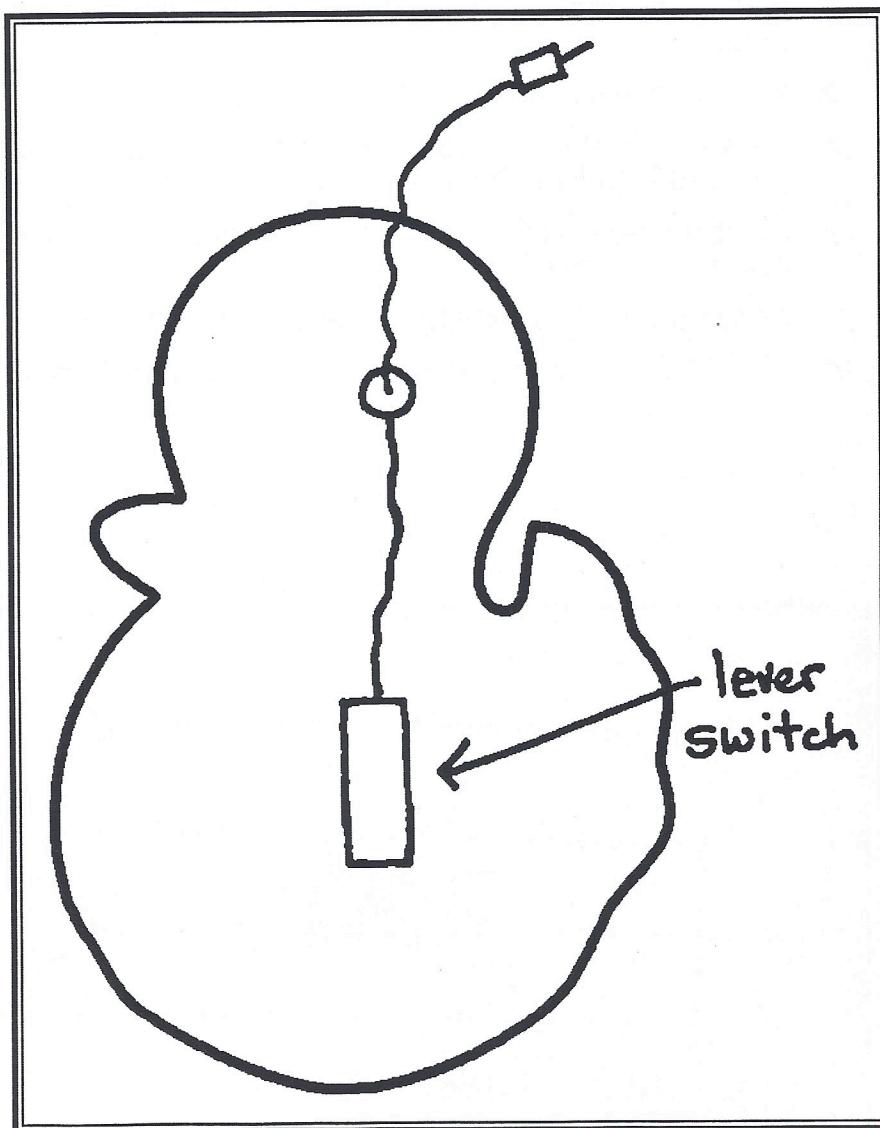
Materials:

- 1 Tummy Soap Sponge
- 1 Roller Lever Switch
(RS #275-017) or (AE # SMS-106)
- 1 3.5 mm (1/8") plug with cord (AE #CB-353)
- Hot-glue and Solder
- Velcro™



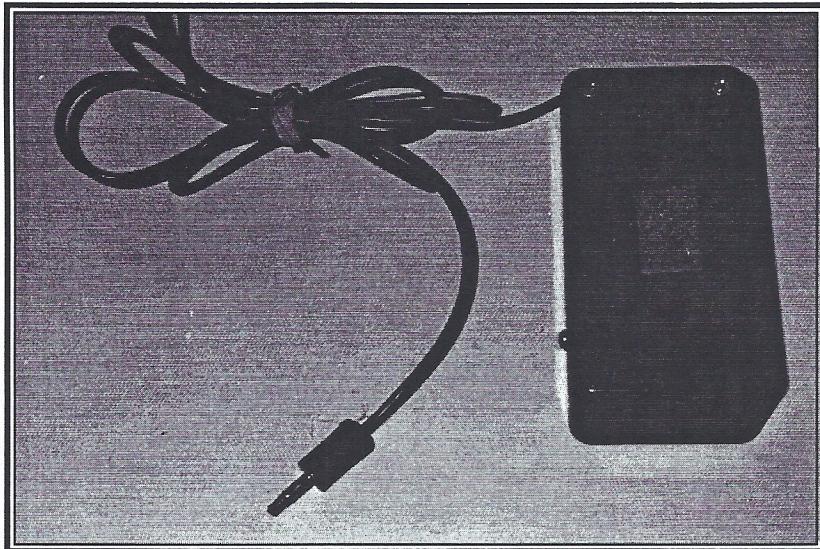
Process:

1. Solder 1/8" plug with stripped ends to the switch.
2. Hot-glue switch to a round flat piece of cardboard that will fit inside the tummy of the sponge.
3. Carefully slice open the bottom seam of the sponge.
4. Insert cord of switch so the plug will come out the hole near the top of the sponge. Pull the cord through and place the switch inside the tummy.
5. Use small, narrow pieces of Velcro™ to close the bottom of the sponge.



▲ Construction diagram for Tummy Soap Sponge Switch

BOX PRESSURE SWITCH

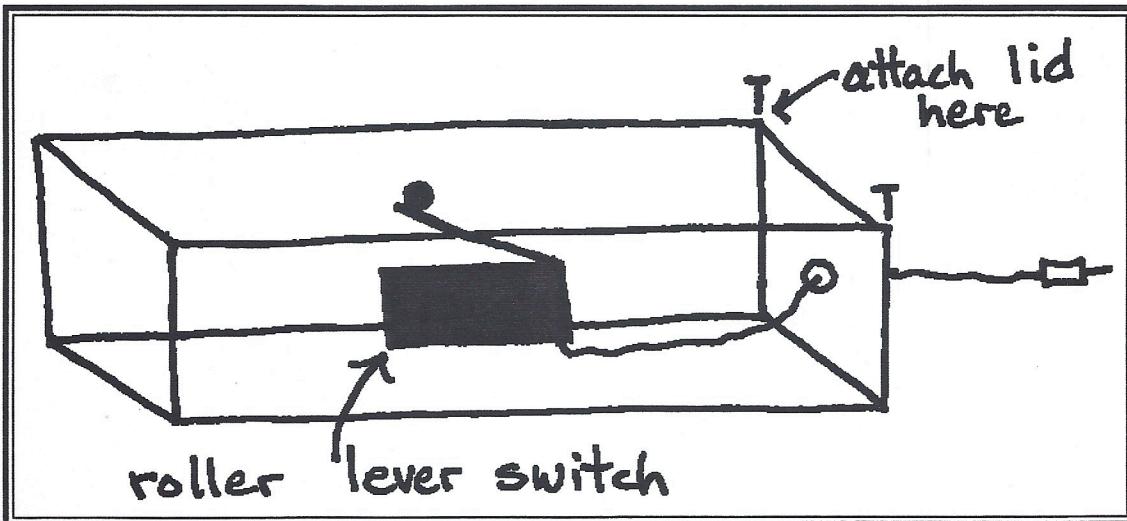


Materials:

- 1 Roller Lever SPDT Switch (RS #275-017)
- 1 Project Box – 4" x 2" x 1" (RS #270-220)
- 1 3.5 mm (1/8") plug with cord (AE #CB-353)
- Hot glue and solder
- 6 washers, 5/32" or 3/16"

Process:

1. Since the lever switch is going to go inside a box, drill a small hole for the cord to go through in one end of the box. Feed the stripped ends of the cord with the 1/8" plug through the hole.
2. Wire the lever switch.
3. Tie a knot in the cord so there will not be so much tension on the soldering points when the cord is pulled. The knot should be right inside the box.
4. Hot-glue the switch in place, making sure that the lever will be located where the desired action will activate it.
5. Attach the lid by screwing the end of the lid down.
6. To get the desired pressure, two or three small washers may be placed under the screws.



▲ Construction diagram for Box Pressure Switch

Materials:

Octagon doorstop with air cushion stop (*Soft Stop Cover Up Doorstop[®], NATIONAL MFG.*)

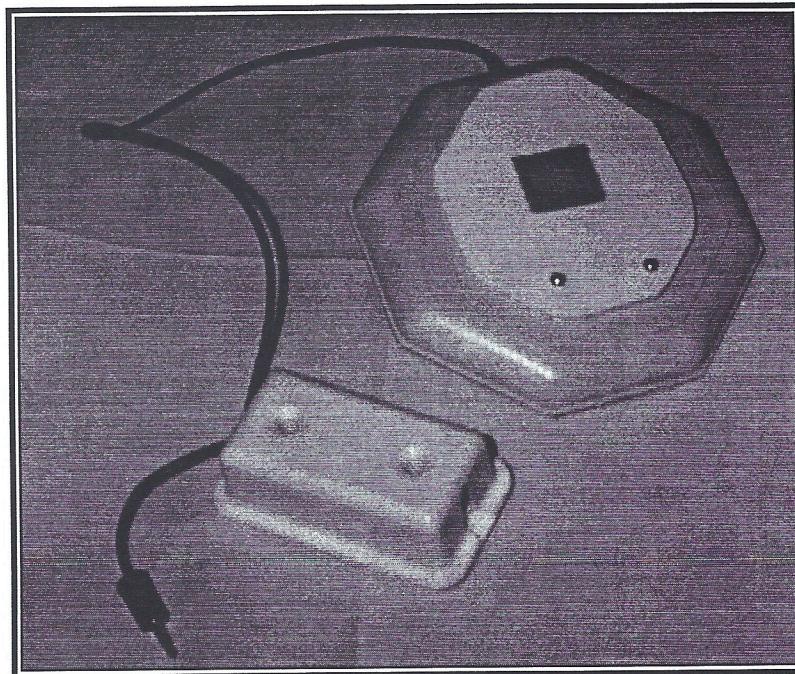
1 3.5 mm (1/8") plug with cord (AE #CB-353)

SPDT Lever Switch (RS #275-016)

Small, shallow plastic box (bird feeder toy works well)

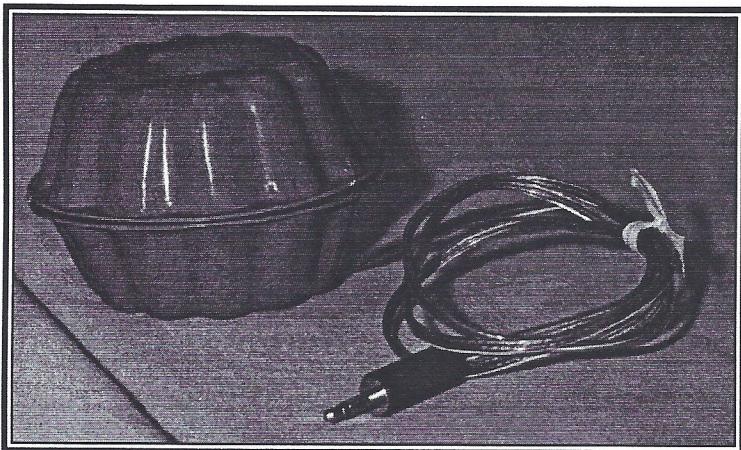
Hot-glue

4" square piece of foam-core board or other solid flat material

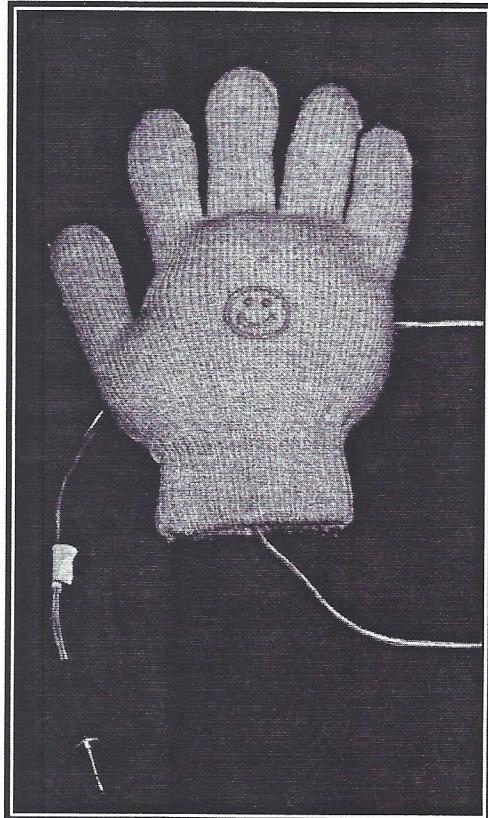
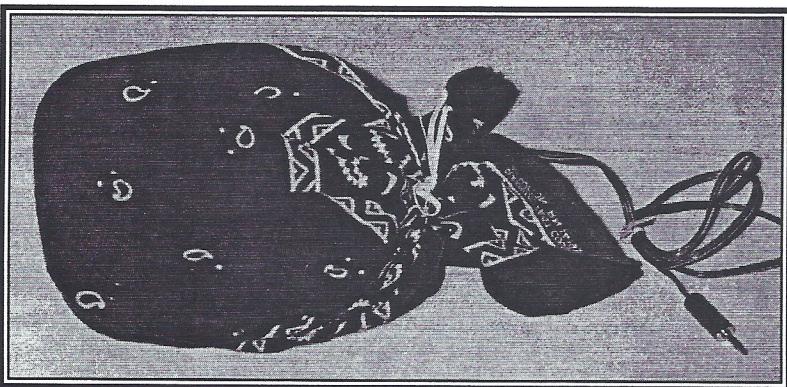
**Process:**

1. Remove the air cushioned doorstop from the octagon plastic portion of the doorstop. (Save the air cushioned piece for a modified mouse click button!)
2. Cut a hole in the center of the octagon large enough to accommodate the switch.
3. Wire the lever switch.
4. Drop the wire from the switch through the hole in the octagon.
5. Hot-glue the lever switch in the shallow box.
6. Hot-glue the shallow plastic box to the back of the octagon covering the hole.
7. Screw the foam-core board or other solid flat material to the top of the octagon.
8. When the flat material is pressed, the switch will operate.

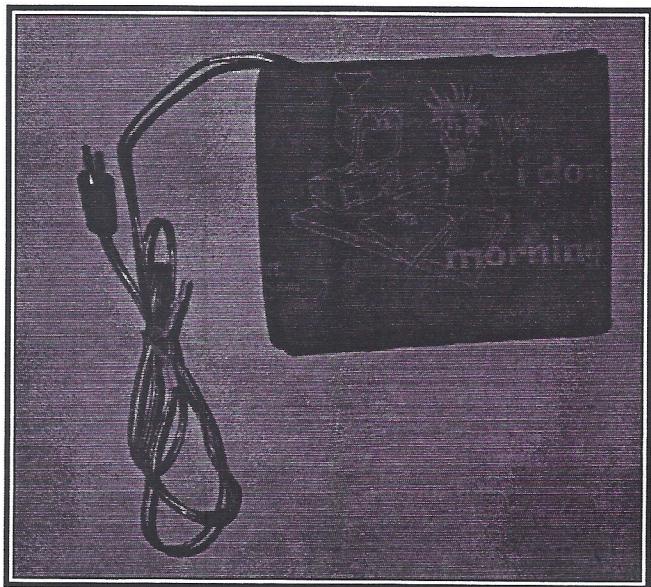
Additional Ideas for Single-Switches



◀ Plastic gelatin molds have a lever switch mounted inside, and are "stuffed" with foam scraps, and then "hinged" with fishing line.

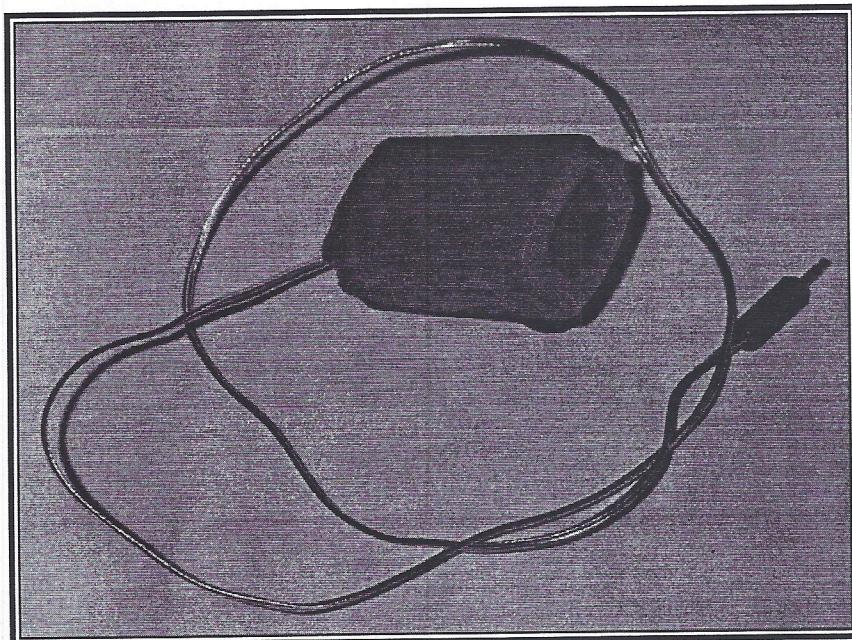
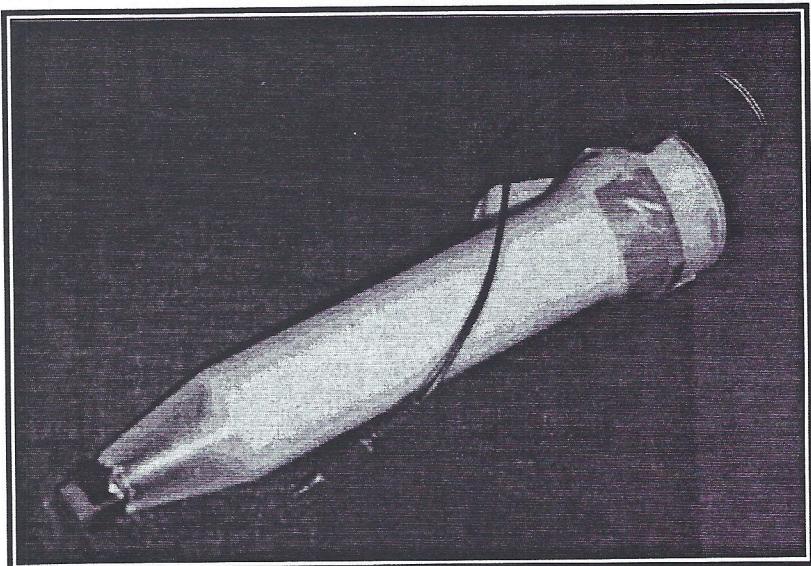


▲ This push switch is constructed of a disposable plastic salad bar container, which has been stuffed with foam scraps and has a lever switch mounted in the center of the container. The bandanna is tied around the plastic container to provide a washable covering for a moisture-proof switch.



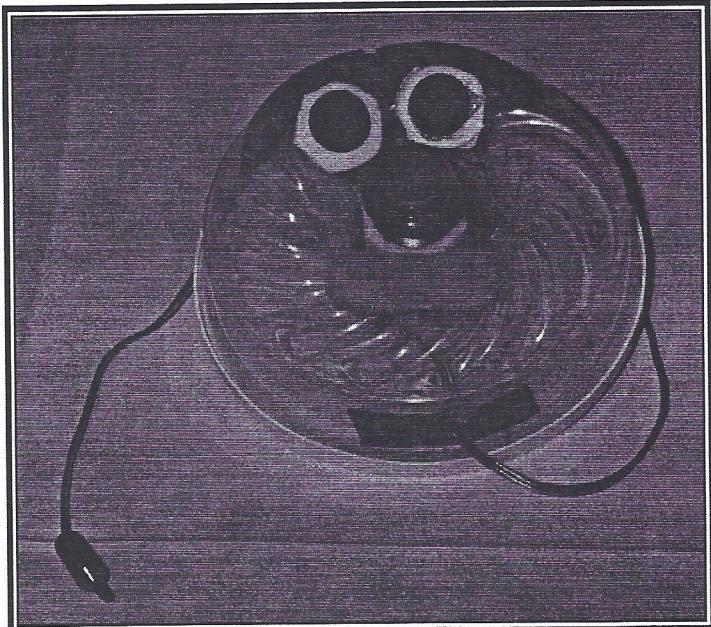
► This switch uses metal-to-metal construction, and is placed inside an insulated soft-drink can wrap (*Chiller® Freezable Can Wrap*). This design provides a soft, pliable housing for a push switch.

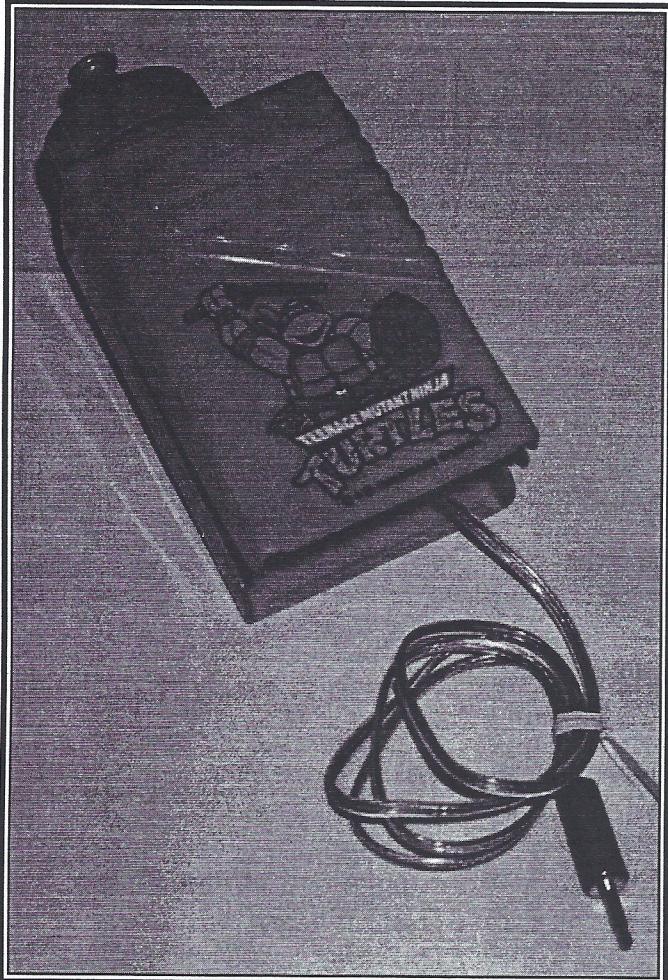
► A large, empty plastic feeding syringe is the housing for this push switch which uses a *Soft-Feel Switch* placed at the tapered end of the tube. This switch is designed to be grasped in the hand, and the switch activated by touching the tip of the syringe on a firm surface.



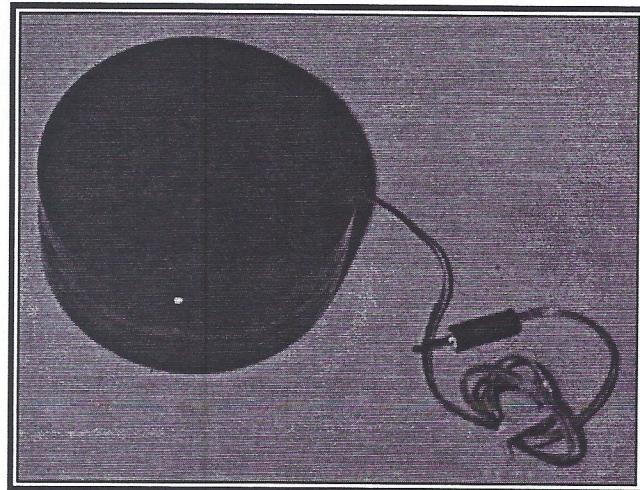
◀ This switch is a lever switch housed in one segment of a gardener's kneeling pad. The switch is designed to be used as a squeeze switch and is of an appropriate size to fit into the palm of the hand.

► An empty, disposable plastic salad container forms the housing for this switch. A *Soft-Feel Switch* is encased under the large button "nose," and the user activates the switch by pressing the button.

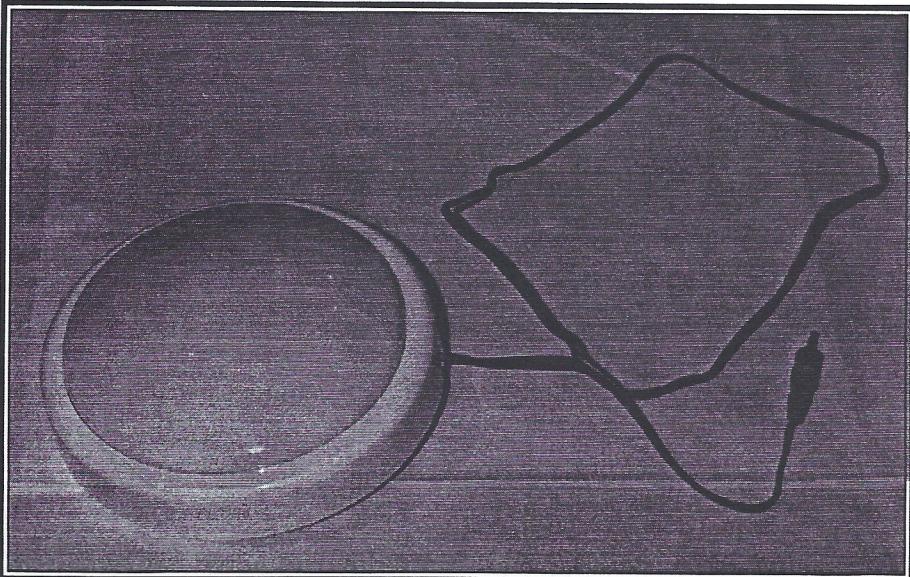




◀ This switch is housed in a plastic juice-box drink holder. The construction employs a lever switch housed in a "foam sandwich" and then inserted into the juice-box holder. The user activates the switch by pressing on the juice-box holder.

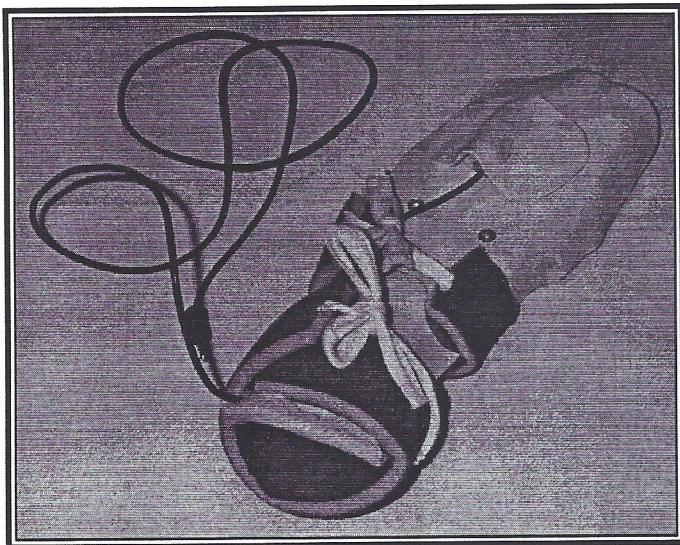
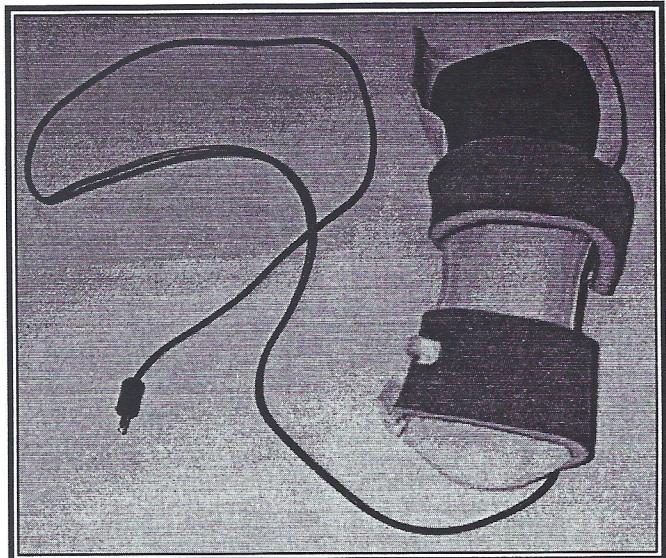


► Colored plastic light covers, hinged with cloth tape, form the housing for this switch. The switch contains a lever switch mounted in foam scraps for stability, and the switch is surrounded by additional foam scrap pieces.



◀ This switch is actually a battery-powered closet light! The closet light (*Moon Light™* or *Touch 'n Lite™*) is constructed as a simple push switch that lights up when pressed. The device was modified by adding wire and a plug to have the closet light act as a switch that will activate a device. The greatest part is that the switch lights up when the device is activated!

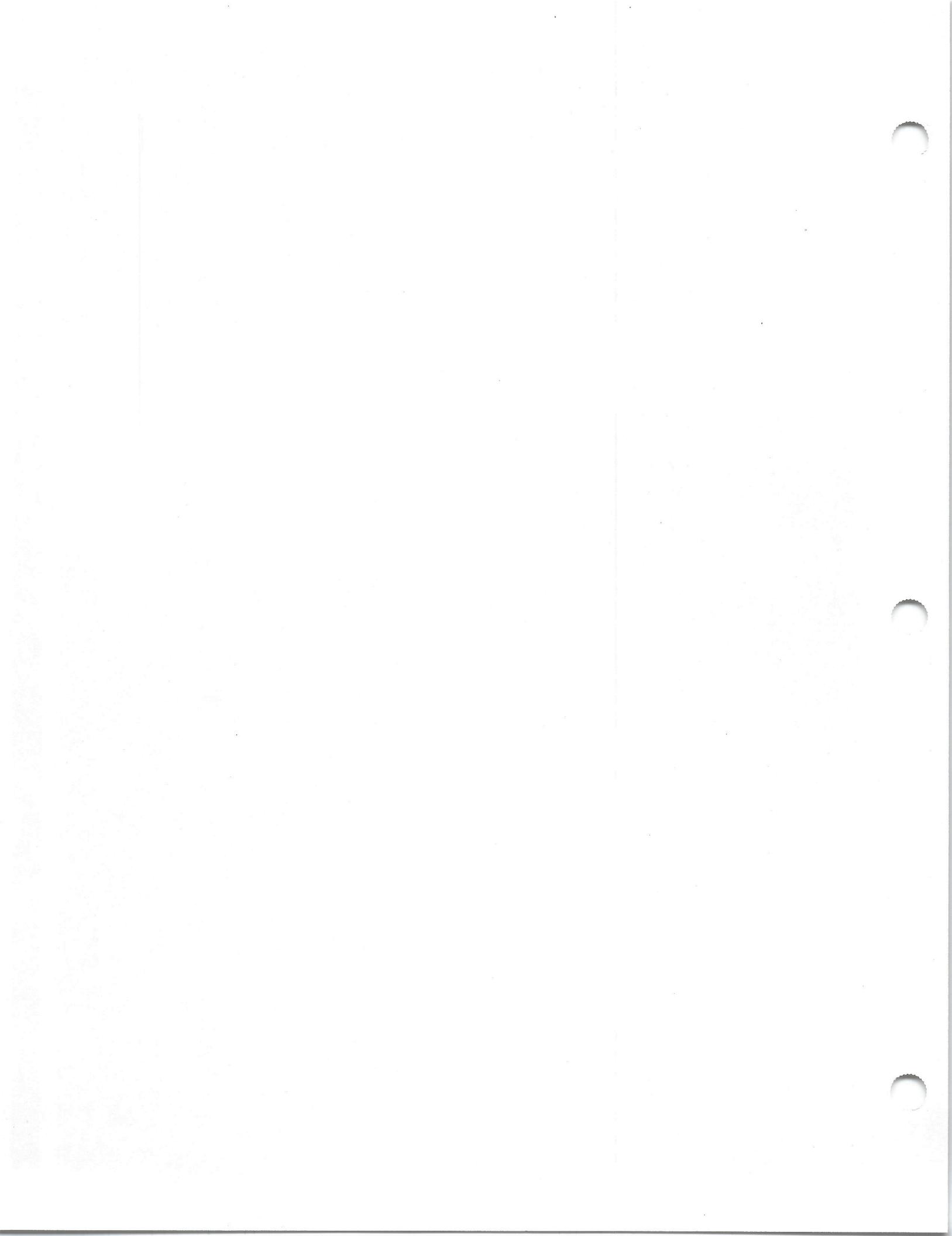
► This final switch in the collection is a very special switch that was created for a very special person. The switch is designed to be worn on the user's arm, and it is activated by the user's finger movement. The switch housing is constructed of *Orthoplast™* (your occupational therapist can assist you in acquiring this material). A lever switch is mounted in the wide portion of the splint and covered with a piece of flexible plastic.



▲ Foam cuffs are attached to the splint, and adjusted to appropriate size using shoe lace ties

► As the final photo shows, when the user is wearing the splint all he/she needs to do is to move his/her fingers and the switch is activated. Since the switch is "attached" to the user, this switch works well for a user with unreliable movements or where localizing to a particular switch location is difficult.





Chapter Two:

Communication, Interaction, and Choice Making

Augmentative and Alternative Communication (AAC), like communication for speaking individuals, should occur as part of the natural flow of daily activities, and should not be limited to certain activities or places throughout the day. To support communication in all settings, an array of high-tech, mid-range tech, and low- or no-tech devices or systems may be necessary for any AAC user. This chapter highlights considerations and construction ideas for the design of low-tech systems to promote interaction and choice making through communication.

Since the main goal of AAC is to establish and support the communication process, the communication system or systems chosen should do just that. The vocabulary and each selected system should support communication by allowing the individual to send messages, to provide information, and to request it. The AAC user needs opportunities to interact and take-turns with individuals as an active participant. As in single-switch design and construction, often peers are the best creators and the ones to rely on for vocabulary selection. Listening to what peers are saying may help determine some vocabulary selections. The vocabulary, like the system, is critical to the user's success.

When looking at vocabulary selection for an AAC user, keep in mind not only what needs to be said, but more importantly, what the user wants to say. Therefore, a communication system should include not only "eat," "drink," "bathroom," colors, alphabet, etc., as part of the essential vocabulary, but also words to control behaviors of others (e.g., "Move over," "Get that," "You do it," "Turn the page," etc.), words to allow for interaction (e.g., "You and me," "Mom and Dad," etc.), words to let the user express individuality (e.g., "Here I come," "I like it," "Yuk!," "Awesome!," etc.), words to express imagination (e.g., "Let's pretend," "Let's play ... , "Imagine that," etc.), words to seek information (e.g., "What," "Where," "Why," "Tell me about ... , " etc.), and words to provide information (e.g., "I want to tell you something," "You know what I did ... , " "I got this new ... , " etc.). If the vocabulary on the communication system does not allow the user to use communication in a variety of ways, transmission of communication will not be as effective as it possibly could be. AAC users frequently get bored with vocabulary that does not allow them to be active participants.

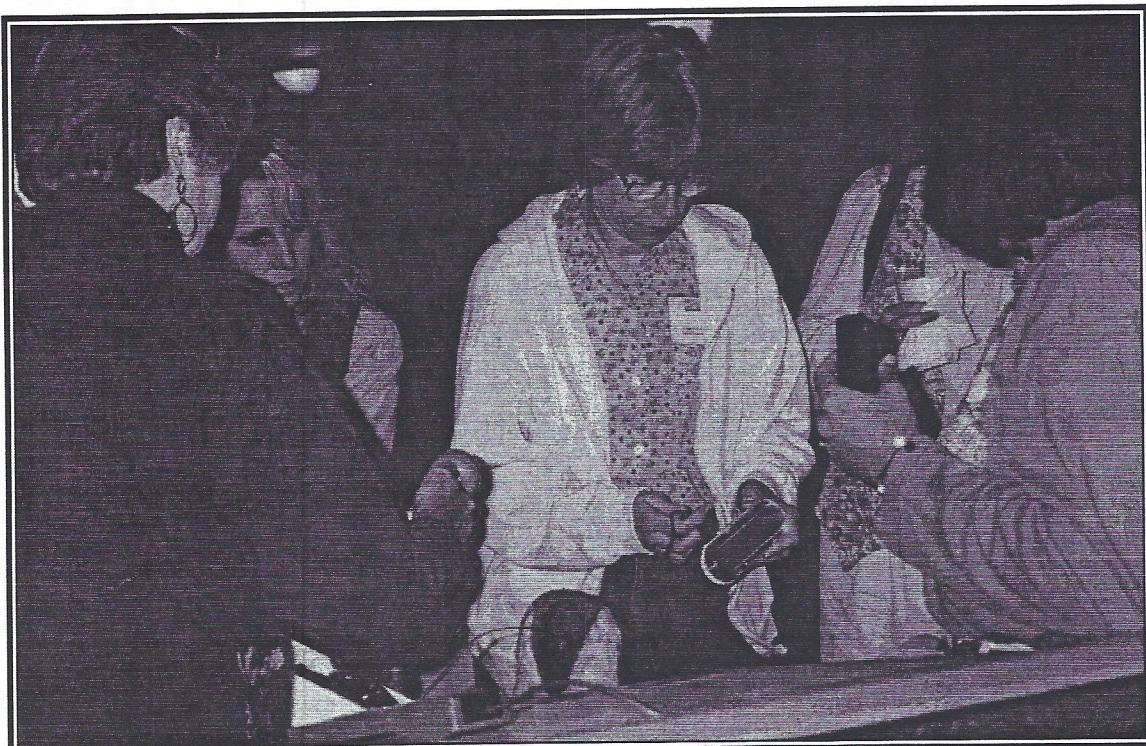
As stated previously, observe carefully what peers are saying in similar situations. Include the style: formal and slang, length of sentences, types of comments, vocabulary choices, and any other factors that may be critical for a like-aged peer and for the user. For example, during lunch time, it should not be assumed that all conversations center around the food being eaten. Although individuals will state whether a particular food is liked, disliked, or hated, this is not the sole conversation during the meal. Therefore AAC users need ways not only to talk about the food quantity or quality, or to indicate what food item should be given next if the individual is fed, but also to participate in any number of unrelated topics discussed (i.e., class assignments, work assignments, recess, TV shows, books, sporting events, current events, etc.). Since predicting exactly what will be discussed is impossible, key phrases and questions that will allow an individual to participate in any of a number of conversations might be readily available, along with "yes/no" and "I don't know" responses.

Thinking About Augmentative and Alternative Communication

The following considerations should be taken into account when developing augmentative and/or alternative communication systems:

1. **Does the system take into account the user's visual abilities** (i.e., acuity, visual fields, light and color reception, etc.)?
2. **Does the system take into consideration the individual characteristics of the user** (i.e., cognition, sensory development and integration, perception, psycho-social factors, physical factors, etc.)?
3. **Does the device support communication as a means to an end** (the basics of cause/effect: I say something and something happens)? Communication systems can help teach cause/effect. Cause/effect should not be a prerequisite to communication, but can be taught through communication. This is where observing a small movement or an accidental activation of a device is important for the shaping of communication.
4. **Does the system support communication that permits choice making?** The individual should be able to use the vocabulary to make choices throughout the day. This includes daily routine activity choices (e.g., what to wear, eat, what activity to complete first, second, etc.) as well as current conversational topics (e.g., reading, recent happenings). The number of choices presented at one time will depend on the individual. Remember to ask the AAC user what vocabulary choices he or she would like on the system.
5. **Does the system support the user's being able to make requests for objects or activities?** The user should not only be able to respond when asked, but be able to initiate a request for a particular activity or item. For a low-tech system, a signal that the user wants to communicate may be needed so the user can gain a listener's attention prior to communicating. The communication signal may make the difference as to whether the individual initiates communication or not.
6. **Does the system support the communication of "yes/no" responses, as well as an intentional non-response?** The user should have immediate access to the vocabulary of "yes," "no," "maybe," and "I don't know." Although these responses do not allow an individual to initiate a conversation, they do allow many individuals a quick response to a variety of topics.
7. **Does the system permit the user to share experiences?** The user needs to be able to share an experience or an activity that has occurred with someone who was not a participant in this activity.
8. **Does the system permit the user to share an activity or participate in an activity in a meaningful and purposeful way?** The system needs to allow the user to participate in an activity in the same way as his or her speaking peers are participating. This should include the chance for the user to state feelings or reactions towards the activity.
9. **Does the system support "greetings" and "closings" in a natural manner?** Greetings and closings of conversations are predictable patterns in a communication exchange. Although they are predictable, they play an important role in the social exchange of communication.
10. **Does the system promote turn-taking as part of the social interactive nature of communication?** Unlike the predictable aspects that greetings and closings play in the communication process, the majority of conversations are not predictable and require an individual to be able to continue to participate in the conversation by taking turns. This includes the ability for the user to be able to ask the questions as well as answer questions, respond to statements, interject comments, provide feedback, enter a conversation, etc.

- C H A P T E R 2**
11. **Does the system allow the AAC user to repair the communication exchange?** AAC users need to be able to control the flow of the conversation and help repair it when it is breaking down (e.g., "Let's start over," "Wait a minute, I forgot what I wanted to say," "I am changing the topic," "I don't understand what you mean," "That's not what I meant," etc.).
 12. **Does the system have room, and a way, for new vocabulary to be added?** Vocabulary selection should be an ongoing process. It needs to continue on a daily basis, or as new situations arise. If at all possible, the AAC user needs to have a signal to indicate what new vocabulary should be added. If the user can control the system, let him/her add the new vocabulary.
 13. **Does the system facilitate interactive usage by a wide range of communication partners?** If the system does not have voice output, the design should allow the user to interact with children through adults (i.e., pictures and words). Again, more than one system may need to be accessible to the user, depending on the audience. The language should allow the user to produce "formal" and "informal" interactions with the communication partner.
 14. **Is the device aesthetically pleasing?** As much as possible, the device should be pleasing to the user and to communication partners. Copies of low-tech communication systems should be kept current so a replacement is close at hand when a system becomes worn. Color-coded copies of communication systems makes keeping track of back-up systems much easier.
 15. **Does the device take into account the user's unique positioning and mobility needs?** Many AAC users need to be moved to multiple positions throughout the day, just as their peers move around the area. When communication systems are being designed, the multiple positions of the user need to be considered. Just because the user is positioned on the floor, in a stander, on a bus, in a car, etc., does not mean that this is a time for the user to be silent. Again, the system needs to be able to be used in more than one situation, or more than one system may need to be used. When considering multiple systems, remember that each system may require different training. When considering the different positions an individual may need to communicate in, the way the device will be transferred from position to position also needs to be considered.



Vision Considerations

When planning for augmentative communication, the user's visual abilities should be considered. Basic considerations include:

- Size of picture, icon or print
- Contrast of the stimulus with the background
- Appropriate lighting necessary to facilitate vision
- Positioning of the communication device
- Number of pictures, icons, words (avoid visual overload)
- Glare from lamination or other protective covering
- Photographs vs. Line Drawings vs. Real Objects

In addition to these factors, it is appropriate to consider the user's visual acuity (how well does the user see?), the user's visual fields (where does the user see best?), and the user's light and color reception. When considering the user's visual acuity, it is important to determine how close (or distant) the communication device needs to be to the user's eyes as well as how large or small the pictures, icons, or words need to be in order for the user to see them.

In terms of the user's visual fields, it is appropriate to consider which is the user's best field of vision (to the right, left, up, or down?). Knowledge of the user's visual fields assists in planning for the most appropriate placement of the communication device as well as appropriate placement of stimuli on the communication device.

Finally, it is important to know if the user has color vision. Obviously this assists in determining if color is a facilitating cue or one that is detrimental to the user's ability to discriminate between stimuli. In this same area, it is helpful to know what type of contrast, between the stimulus and the background, is appropriate and helpful to the user. Sometimes a higher contrast is not always better. It may be appropriate to investigate whether the user responds best to a dark stimulus on a light background or the inverse (light stimulus on dark background). It is also important to determine if the user benefits from having a light source behind the stimulus, enhancing illumination.

In a nutshell, the "whole" user must always be considered, not just the aspects of the user needing accommodation or adaptation. An AAC system is meant to be used to aid in the communication process, not to test receptive language.

The extent to which the adaptation/accommodation calls attention to the user in both negative and positive ways needs to be considered. It is equally important to consider the extent to which the proposed adaptations/accommodations are realistic and practical. Sometimes what is possible to do is not always realistic, and compromises may need to be reached.

Frequently more than one communication system is used for individuals to communicate effectively. Rely on the AAC user to indicate what system might work best in each situation. Multiple systems may be needed and prove to be very effective even in one situation.

Since different situations throughout the day require different vocabulary selections, observe several typical days from the beginning to the end to find out what types of vocabulary choices will be needed. Record what peers talk about. This needs to be recorded in the peer's language.

Since high-tech communication systems are not appropriate for some situations (e.g., water activities) and since they may at times break down, a back-up low-tech system should be kept up to date. These systems again are more effective in certain situations.

Ideas for Low-Tech Communication and Choice Making

Basic Communication Boards and Notebooks

- When creating a communication board or overlay, the types of stimuli needed to help the user retrieve words or phrases need to be considered. A range of materials can be used, depending on the user's cognitive, visual, motor, auditory, and tactile skills. The communication board pictured below shows a variety of items that may be considered as stimuli for an AAC user.

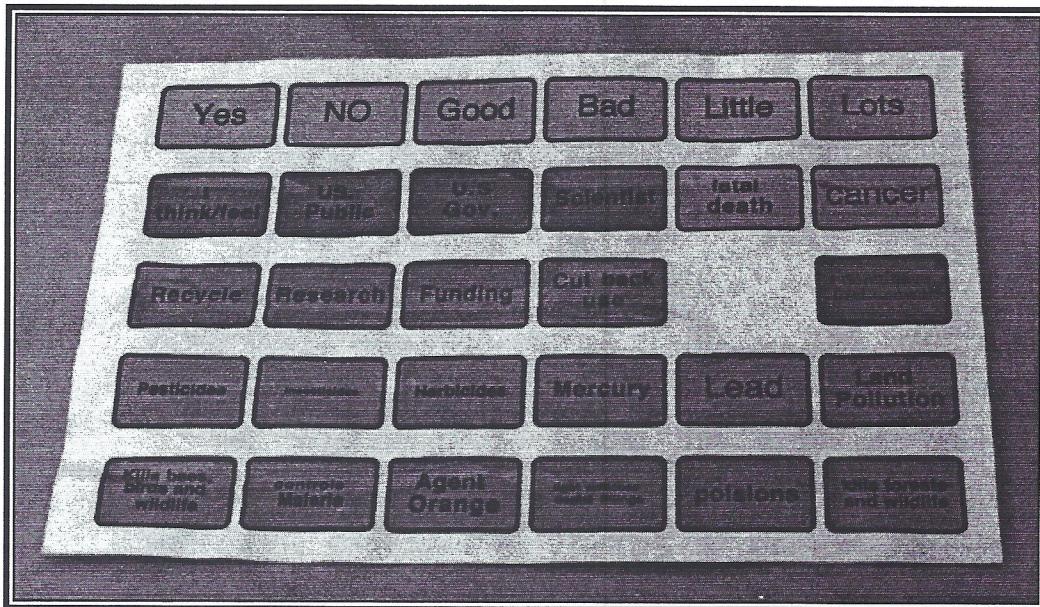
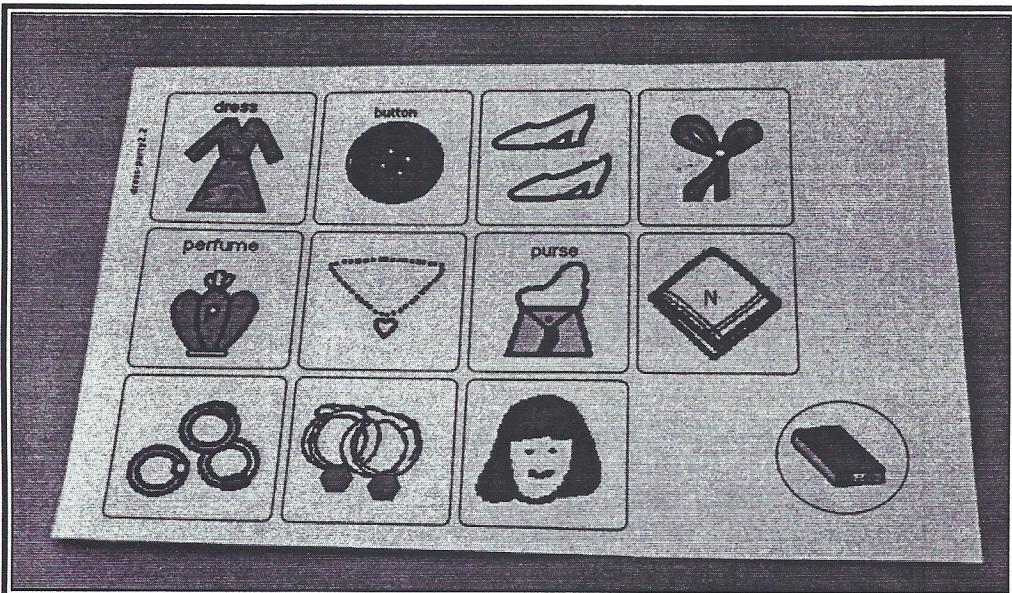


For example, the actual object, or tangible item that represents the object or activity, can be used effectively (e.g., paper cup for "drink," etc.). Miniature items can be used if the user understands that the miniatures represent the life-sized item. It is important to remember that for a user with visual impairment, a miniature object may only be a texture and not actually a valid representation of the real item.

Textures can be used for persons with severe visual impairments. Textures, paired with pictures or icons, may help some users who have no visual impairment retrieve phrases and thoughts. Color may also help users recall information better.

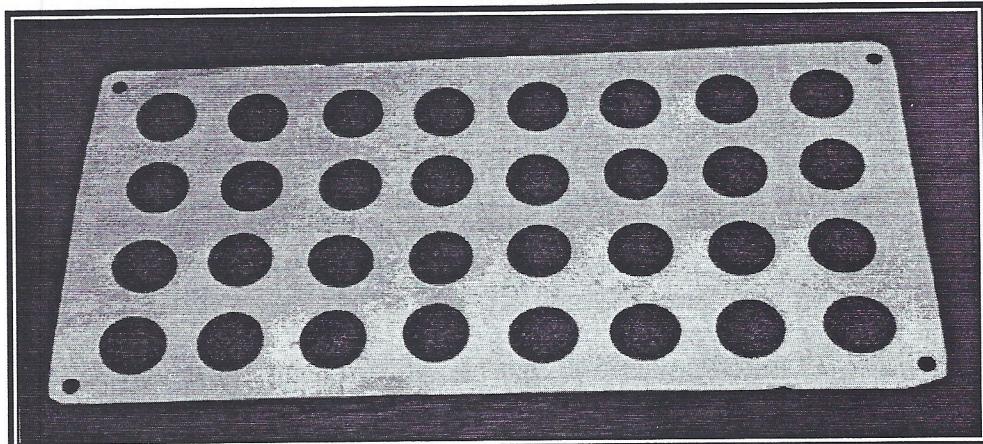
As a user's communication skills increase, pictures and icons can be replaced with text. It is important to remember that communication systems that rely on text alone can limit the communication partners available to the user. Persons with limited reading skills, or who are non-readers, will have difficulty interacting with a user who employs a text-only system or device.

Use the same icons or pictures on the classroom bulletin boards as are used on communication devices. This provides a shared symbol system among all children.

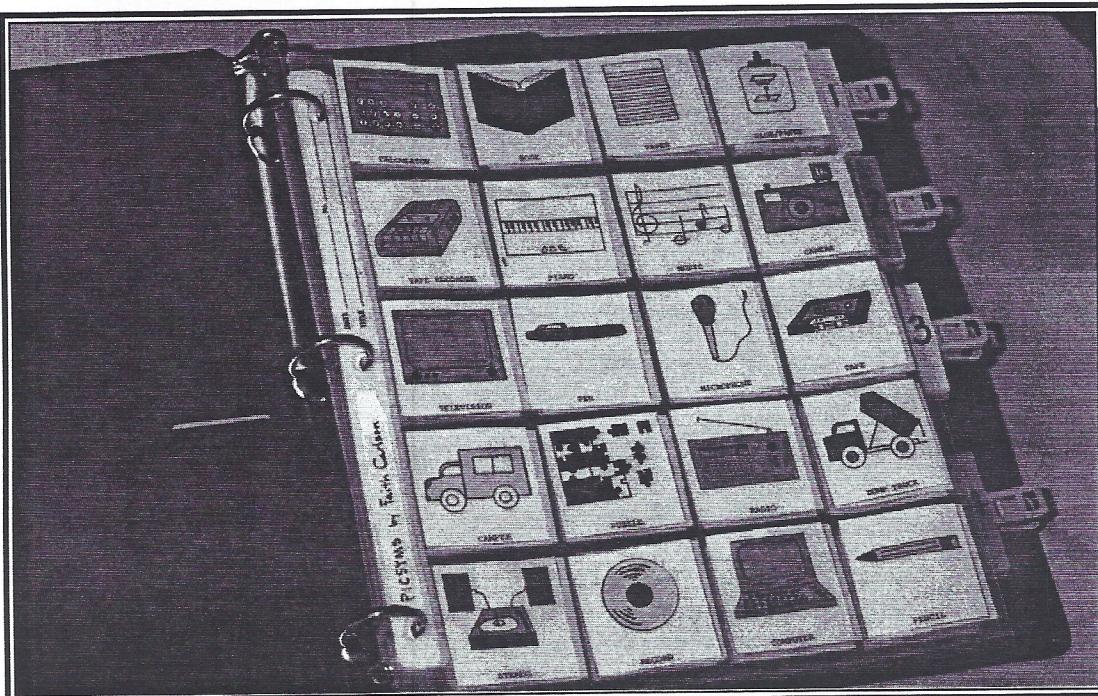


- - 3. Include instructions to the communication partner, written in the user's voice, on all communication devices to facilitate positive interaction with the user. A good strategy is to begin the instructions with "ATTENTION EVERYONE." This type of introduction indicates that the augmentative communication user expects to communicate with everyone in his/her environment. Issues of "wait time" may need to be included in the instructions to prevent communication breakdowns.
 - 4. When creating low-tech communication and choice-making boards consider constructing them to match the dimensions of a computer peripheral, or the child's own stand-alone communication device, to facilitate easy transfer to an electronic system. When boards are created that fit on the surface of the PowerPad™ (DUNAMIS, INC.), or the TouchWindow™, (EDMARK, INC.), Key Largo™ (DON JOHNSTON, INC.) or Intellikeys™ (INTELLITOOLS, INC.), a low-tech board can easily be turned into a high-tech device with voice output!
 - 5. Provide speaking peers with the freedom and support to suggest new vocabulary and phrases for non-speaking peers to facilitate social interaction. Perhaps a "vocabulary box," clipboard, or notebook, etc., could be available in the classroom for peers to provide suggestions. Give peers access to icon books, computer-produced icon programs, graphics programs, etc., to permit them to suggest icons as well as text.

6. Design communication partner books – one book for the communicator and a separate book for the partner, with complementary vocabulary in each. This approach may facilitate modeling of the turn-taking aspect of communication for nonspeaking users.
7. Use low-tech communication techniques for all students in a classroom to deal with the expression of feelings and moods. Select icons that depict various emotions, and copy them on appropriate colored paper to express various moods (red = angry, blue = cool, etc.). Each student can have a small “feelings” notebook to use to express and clarify feelings, or use them on a bulletin board for access by all students in the room.
8. When developing a low-tech communication board, mount the message text below the icon for the user to see, and then invert the text and mount it above the icon for the communication partner to see. This type of strategy facilitates face-to-face communication. For young users consider double-mounting icons – one facing the user, the other facing the communication partner – to facilitate interaction with peers who are not yet readers.
9. Hot-glue colorful plastic cookie cutters on a foam sheet overlay for the *PowerPad™*, *Intellikeys™*, *Key Largo™*, *KE:NX on Board™* (*DON JOHNSTON, Inc.*) or *TouchWindow™*, providing tactile, 3-D “targets” for user choices.
10. Use cork spots on ▶ communication systems or overlays to make the device more pressure sensitive. Put the cork pieces on a file folder to go under the overlay to match the target symbols and areas.

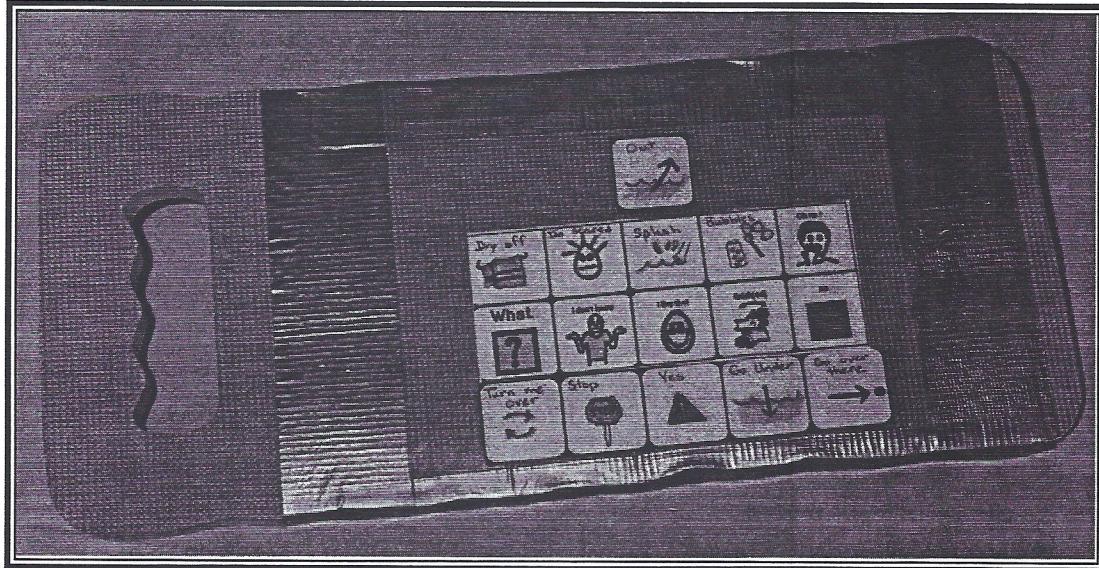


11. Use small snack bag clips as page-turners for communication notebooks. The clips can be ▼ covered with colored tape and then numbered to facilitate organization of the notebook, as well as to assist with page-turning.

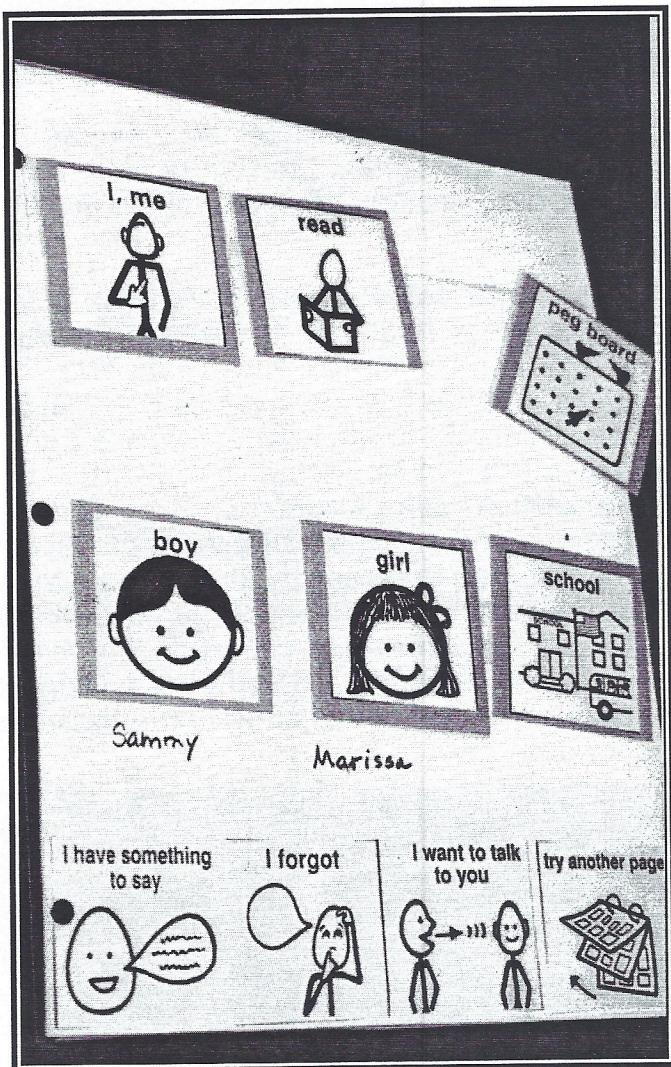


Communicating and Making Choices in All Environments

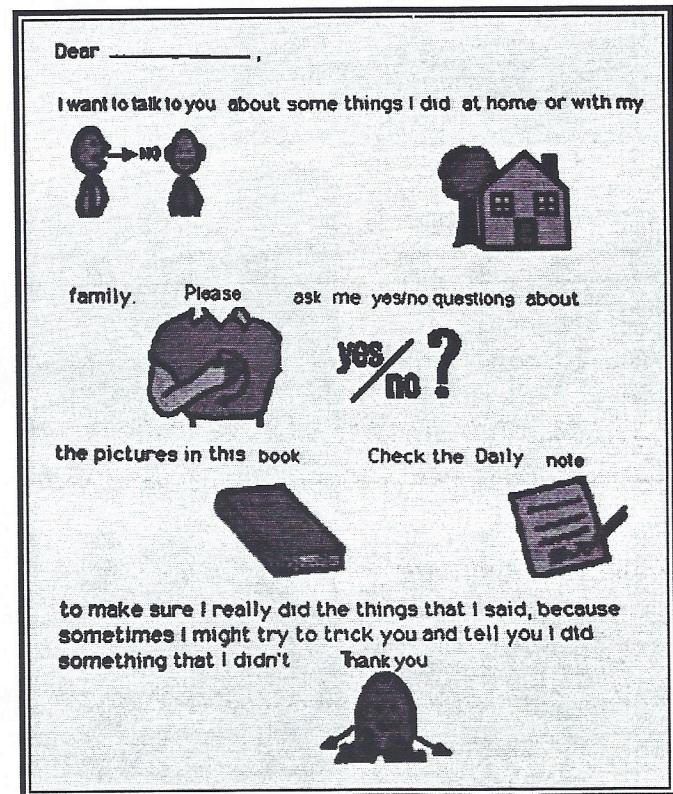
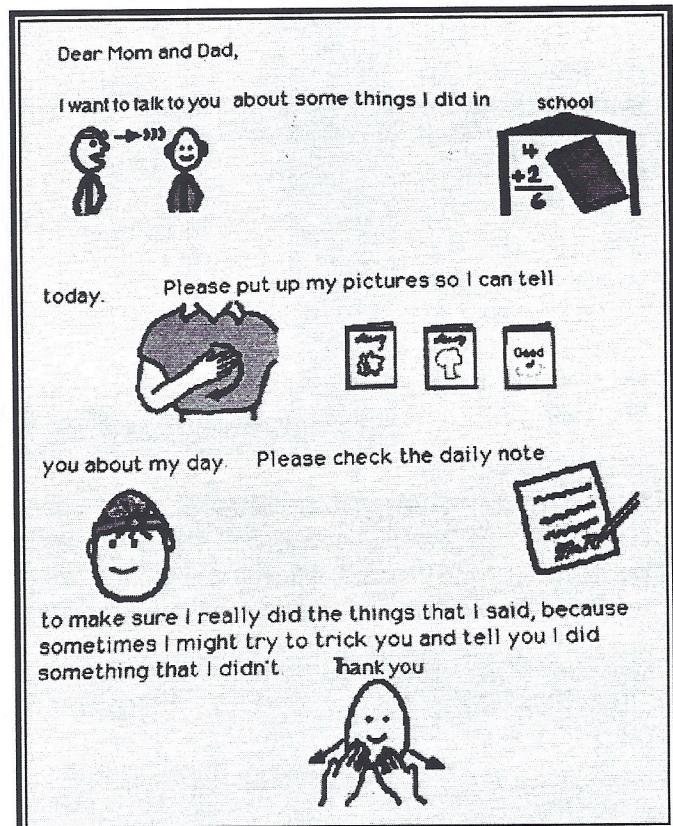
1. **Communication Bags** are great in a classroom. Place categories of communication symbols in small plastic bags. *Velcro*™ the bags to the walls of the room. When an activity occurs that needs a specific symbol or symbols, pull down the bag and place the symbols on a temporary communication board so the user has vocabulary immediately. This strategy works well for centers in the classroom as well.
 2. Adapt recipes using icons to represent the equipment, ingredients and supplies needed for cooking. Share these recipes with families through a newsletter, or compile your own classroom cookbook that can be sent home as a gift.
 3. Construct a **Floating Communication Board** for use in the bathtub or swimming pool. A ▼ gardener's knee pad with cutout handle, communication pictures and symbols, clear *Contact*™ paper, and duct tape are needed for this project. Choose the symbols or pictures to be used and laminate. Place the symbols or pictures on the knee pad and cover with clear *Contact*™ paper. Wrap an additional layer of clear *Contact*™ paper over the symbols and around the knee pad. Place duct tape around the edges of the knee pad to seal out water. This type of floating board works well in the bathtub or swimming pool where more traditional types of communication devices or electronic systems are not functional (or safe!). This type of floating board can also be constructed from a foam kickboard. The benefit of using the gardener's knee pad is that it comes with a handle built in, which allows for easy retrieval by the user.



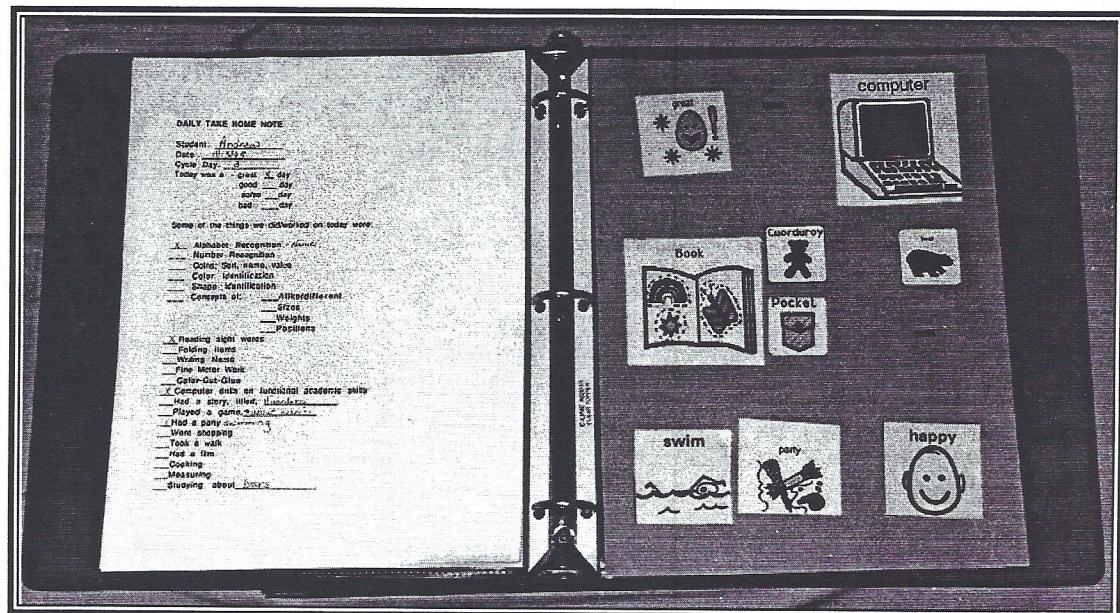
4. To help maintain daily contact between home and school, consider constructing a **Home-School Notebook**. A Home-School Notebook helps the AAC user "tell" about his/her day at home or at school. The 3-ring notebook contains a laminated list of activities that frequently occur in the classroom, and a sheet of activities that typically occur at home is also prepared and laminated. Pictures or icons that match each activity are laminated and have *Velcro*™ attached and are stored in a pocket in the back of the notebook. Additional blank pages are laminated, and *Velcro*™ strips are adhered to the pages. These blank pages are included in the notebook. ▼ ►



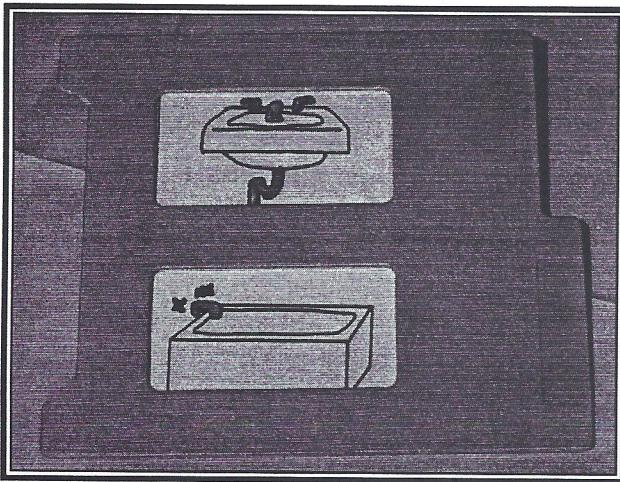
At the end of each day the teacher checks activities that occurred that day. Use a *Vis-a-Vis*™ marker or dry-erase pen to permit easy cleaning of the surface to reuse the notebook again and again. The user's family checks activities that occurred at home in the evening, or over the weekend, prior to returning the notebook to school the next day. The pictures or icons that match the activities are velcroed on the pages



immediately following the checklist "note." When the user arrives at school or home, the notebook can immediately be opened, the note reviewed, and then the user can use the subsequent picture/symbol pages to communicate about his/her day.

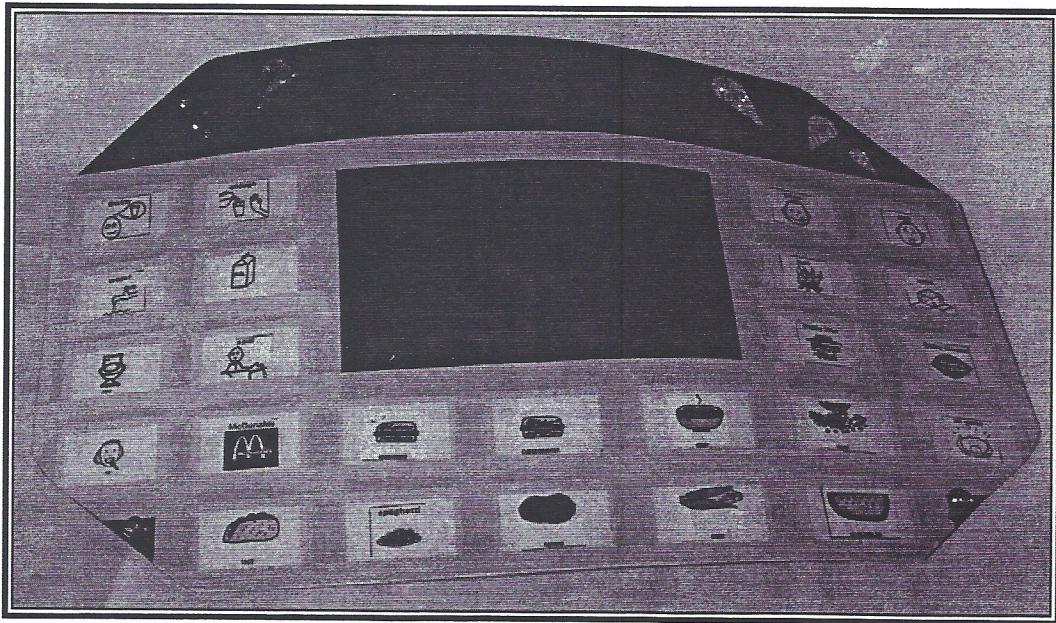


When constructing this type of notebook, it is important to remember to include the categories of "nothing" or "nothing special" in the laminated note. AAC users should have just as much opportunity to respond with the word "nothing" to the age-old question, "What did you do in school today?" or "What did you do at home this weekend?"

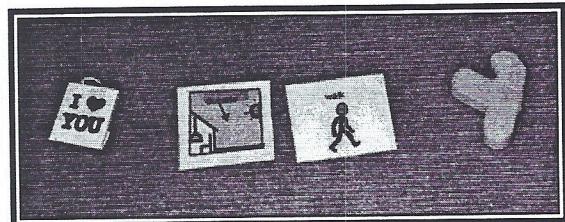


5. Plastic disk dividers (from 5.25" disk boxes) make great "frames" for communication boards. Most of these dividers have two "windows" that easily accommodate 2" x 2" icons. The divider fits inside a sandwich-size Ziploc™ bag which can be sealed to make the communication boards waterproof. Magnets can be hot-glued on the back of the frames to provide ready access to choice-making at the refrigerator. Velcro™ strips can be glued onto the back of the frames, with corresponding Velcro™ strips attached to cabinet fronts to support choice-making in other areas of the classroom or home.

6. For communication during snack and meal times, mount icons on vinyl placemats and cover with clear Contact™ paper. Another strategy to consider is mounting icons on a vinyl tablecloth at the user's place.

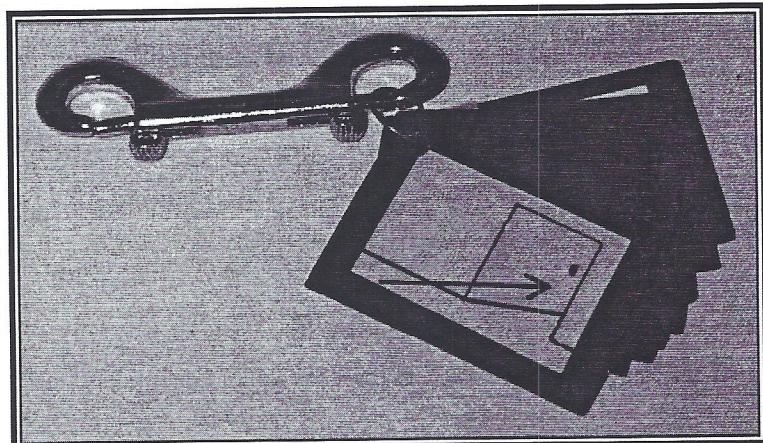


7. Convert board games for nonspeaking users by remounting the game board on a larger surface and placing icons that correspond to game rules and "moves" around the edge of the game board.
8. Use old foam puzzles that are missing pieces as templates for communication and choice-making. This works well for attendance activities during circle time by placing a photograph of each child in the class in one "cell" of the puzzle frame.
9. Use icons to represent choices of fingerplays and songs for circle time, asking each child to indicate his/her choice by selecting the appropriate icon. Icons can be mounted on a clock communicator with single-switch attached, so that children who are unable to point can press the switch until the pointer indicates their choice.
10. Use indoor-outdoor carpet as a backing for communication icons and pictures. Place *Velcro*TM on the back of the icon/picture, and it will stick to the carpeting. This works well for communication during floor activities. ►

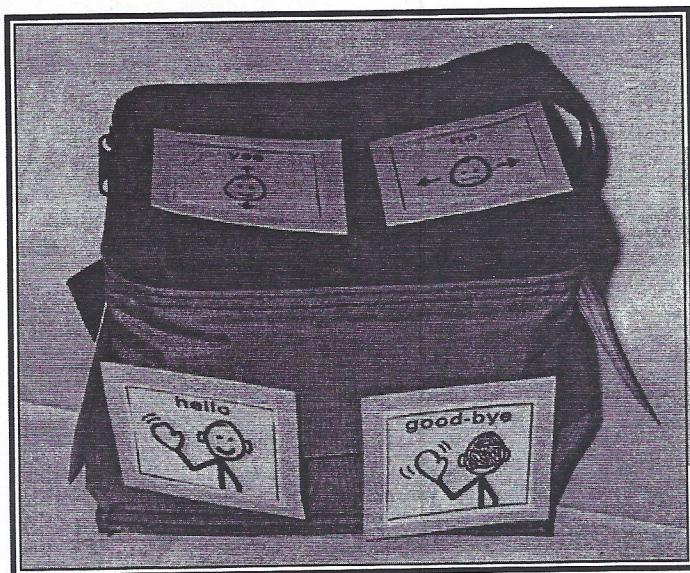


Portable Communication

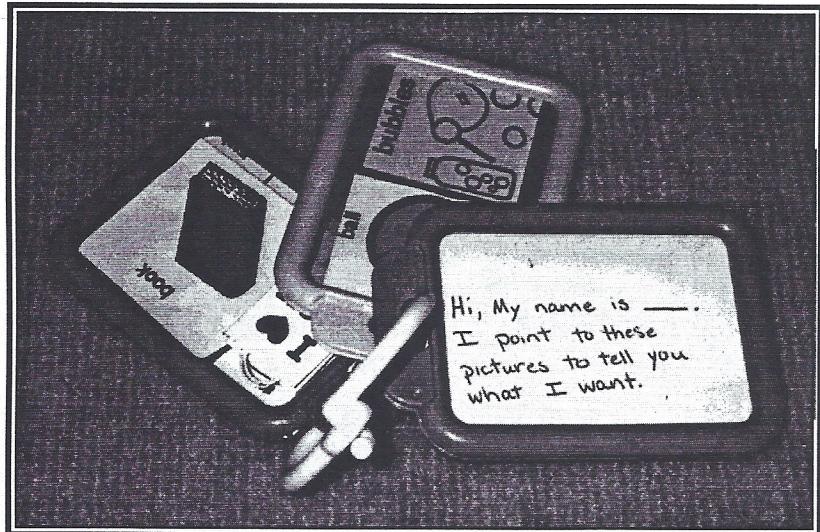
1. Portability needs for ambulatory augmentative communication users may be addressed through the design of communication necklaces. *Skinny S'getti String*TM, available at craft stores, is extremely pliable cord that stretches significantly when pulled and is not apt to "choke" the wearer.



2. A belt-loop communication system can be designed using a double-ended clasp. The communication symbols can be attached to one end of the clasp, and the other end of the clasp can be hooked on the user's belt loop. ►

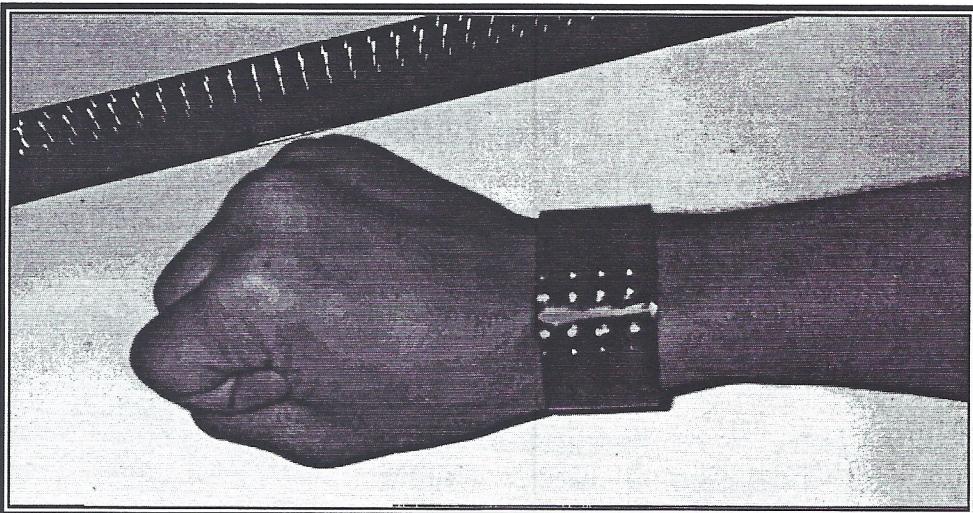


3. Attach *Velcro*TM pieces to the user's backpack, lunch bag, or jacket sleeves to accommodate communication symbols with *Velcro*TM. Simply stick on appropriate communication symbols and the user has a way to communicate while mobile. This system works very well for users who are transported to and from school, or within the community, when their primary communication device may be stored during transit. ◀

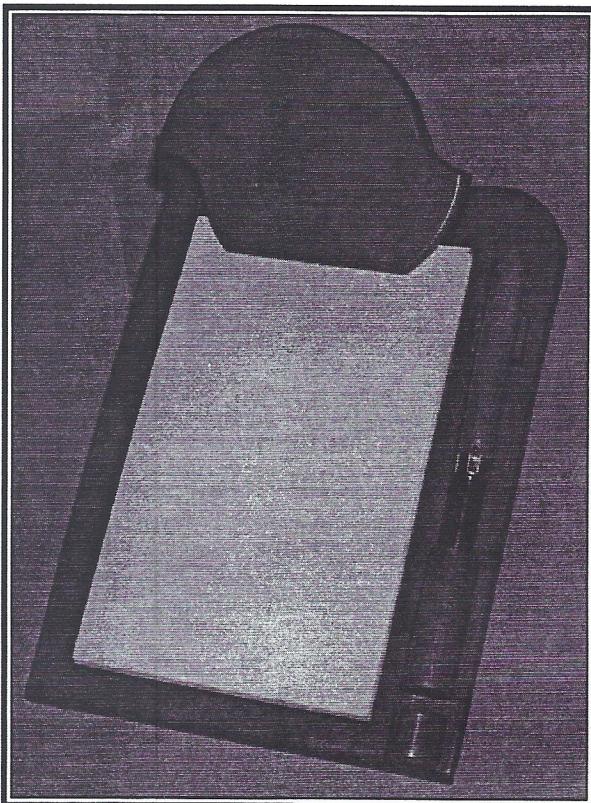


4. *The First Years – My Own Photo Ring™* works well for a beginning symbol/picture communication system for a young child. The ring contains three plastic frames that can house photographs, pictures or icons on both sides of the frame, providing six communication stimuli. The ring is lightweight and portable and can be chewed on or drooled on without any negative consequences.

5. For "go anywhere" communication for a child who uses an eye-gaze system, use snap bracelets. The bracelets can be worn by the communication partner, and icons can be attached to the bracelets with *Velcro™*, making for a simple and portable communication system. This strategy can also be used for "yes/no" communication using a red snap bracelet for "no" and a green bracelet for "yes." The user can eye-gaze towards either bracelet to respond, or can point to the bracelet that indicates his/her answer. The user could also wear the bracelets and move the appropriate hand to indicate the response.

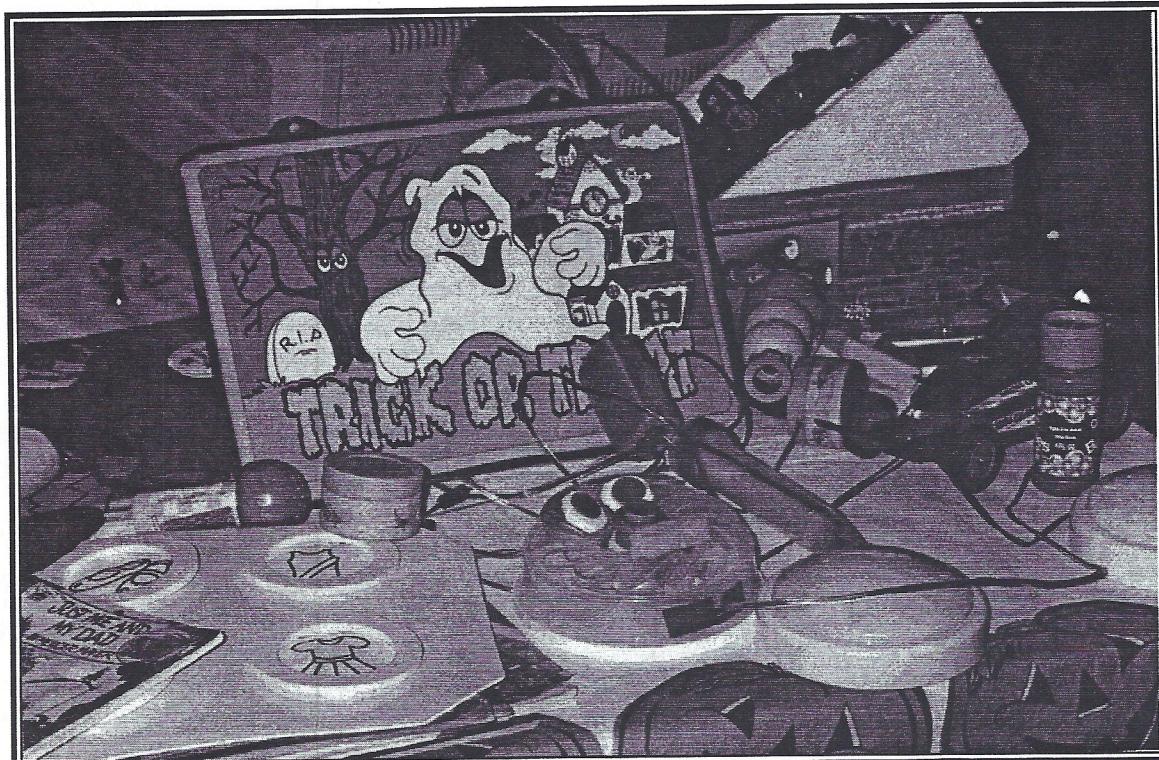


6. Use a *Shopping Cart Memo Pad™* to attach to the handles or bars of a wheelchair. This device works well to jot down new vocabulary the user needs at the time the situation arises. It also works for home-school communication and notes from therapist to teacher.



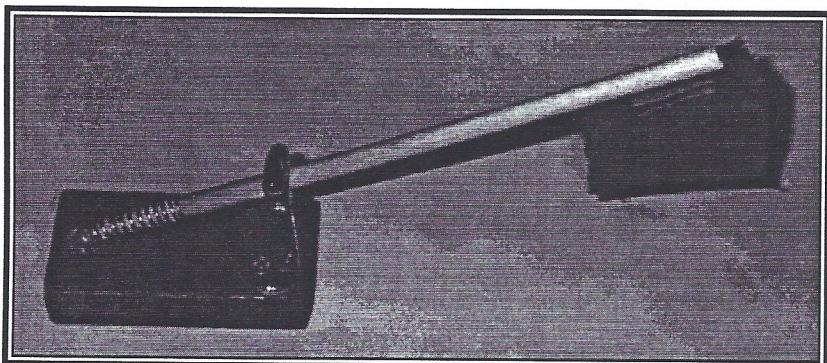


- ▲ 7. At Halloween time, use a talking Halloween door mat to effectively and "spookily" communicate "Trick or Treat." Place the Halloween door mat on the user's wheelchair tray. Anywhere the user presses will activate the mat. Different mats have different messages, but all play "spooky" Halloween music and then say, "Trick or Treat."



Signaling Devices

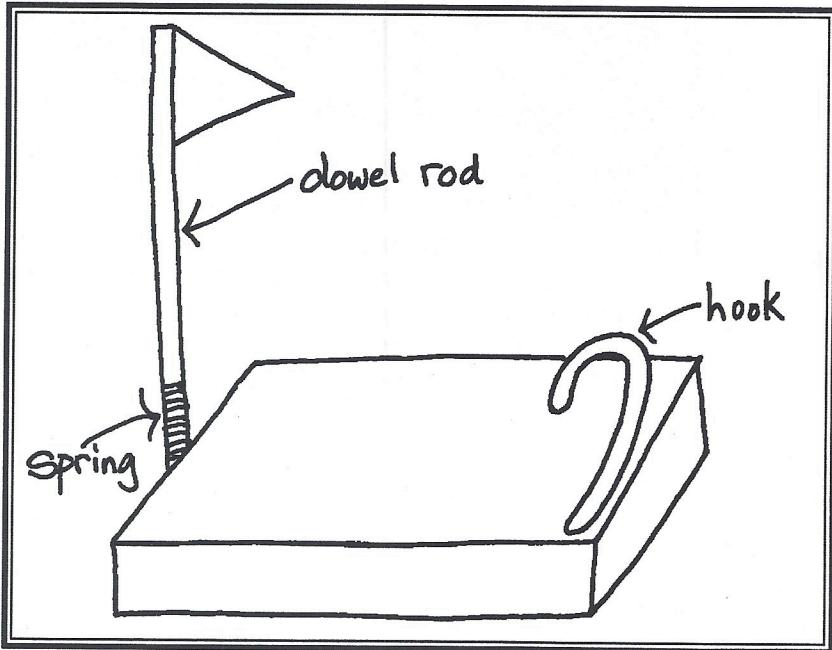
- ▼1. "I Know the Answer" – "I Have Something to Say." Many times the AAC user has a limited capacity to raise his/her hand to respond to a question or to indicate that he/she has something to add to the discussion. A simple signaling device can be created using a wooden block, a spring, a dowel rod, a wardrobe hook, some *Velcro*™, and a fabric scrap.



The wood block should be approximately 4"-6" long, 3" wide, and

1" thick. Attach the wardrobe hook to the top of the block horizontally across the width of the block. Attach the spring to the other end of the block. Place the dowel rod in the spring, and secure with hot-glue. Add a fabric flag to the top of the dowel rod.

Hook the dowel rod under the wardrobe hook. Now the user can slide the dowel rod out of the hook and the flag raises automatically to indicate "I know the answer!" Attach *Velcro*™ to the bottom of the block, and to the table or wheelchair tray surface for stability.



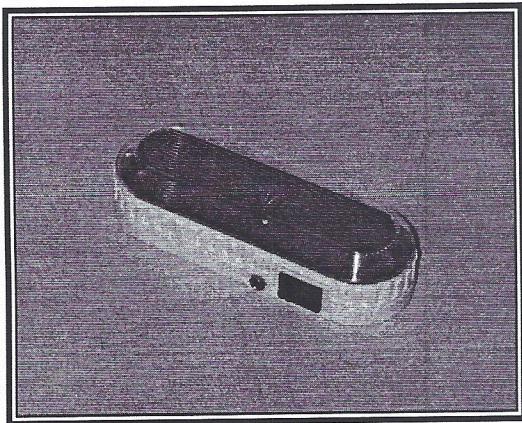
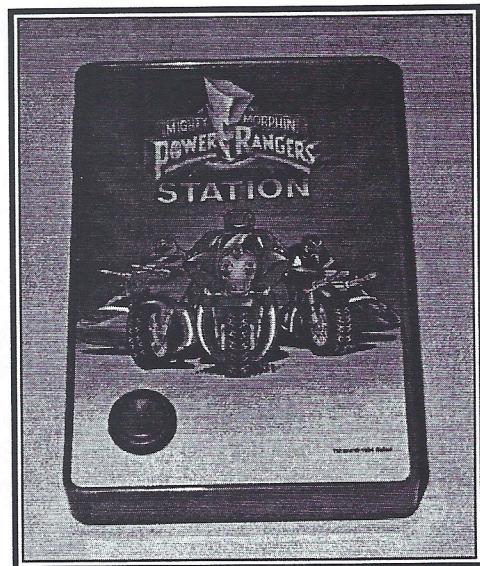
- ▼2. *Lites 'n Plates*™ Signaling Device – The *Lites 'n Plates*™ bicycle license plate device can be adapted to be a signaling device for the AAC user. The device can be temporarily modified for single-switch access using a battery interrupter or can be permanently adapted by installing a jack for the single-switch.



After modification is complete, place the yellow adhesive letters on the plate surface to indicate an appropriate message – "Help Please," "My Turn," "I Know," etc. When the user presses the external switch, the lights surrounding the plate are activated and move around the plate in a flashing manner. *Velcro*™ can be attached to the bottom of the *Lites 'n Plates*™ device and to the table or wheelchair surface for stability.

3. Closet Light Signaling Device – A battery-powered closet light, such as the *Touch 'N Lite*® or the *Moon Light*®, can be used as signaling devices. Both of these products are large, round switches that light up when pressed. The switch mechanism contained in both these types of lights is very light touch and the device requires no modification. The user can push the light to provide a visual cue to signal for attention. *Velcro*™ can be attached to the bottom of the light and to the table or wheelchair tray surface for stability.

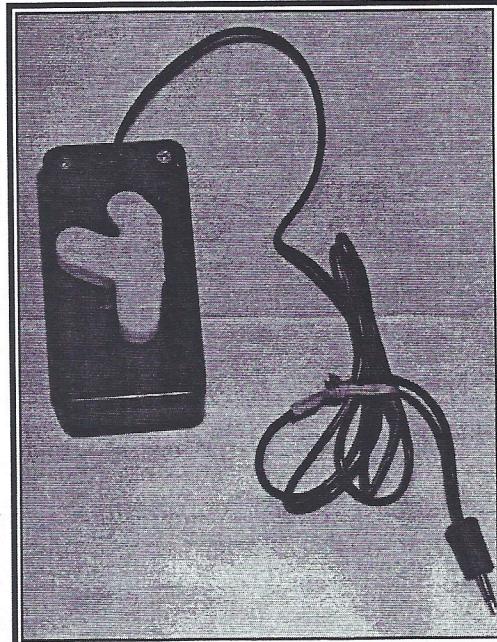
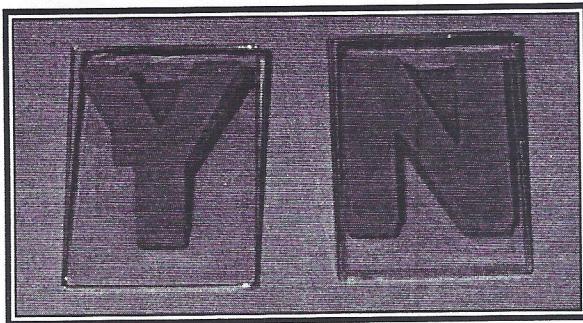
4. *Mighty Morphin Power Rangers Station Doorbell™* — This device is manufactured with a red push button switch on the surface. It requires no modification. The device could be placed near a door for a user to signal that they need help opening the door, or it could be used as a signaling device with an auditory signal. ►



5. The *Lites Up Lite Clip™* is another battery-powered closet light that is easily adaptable for use as a signaling device. Modify the light for single-switch access by rewiring the light switch and adding a jack for switch plug-in. The *Lites Up Lite Clip™* provides a visual signal for attention. Adding *Velcro™* to the underside of the light and to the table surface or wheelchair tray for stability is a good idea.

General Ideas

1. Use *Velcro™* on boards and objects to develop a reminder board, or a task analysis system, where the user moves the object to another section of the board when that step of the task is completed. This system works well for organizing all sorts of tasks in the classroom and at home.
2. Hot-glue *Foam Bath Fun Letters™* to the top of switches for visual or tactile feedback. The "Y" and "N" letters can be attached to home-made switches that are activated as a "yes/no" communication system.

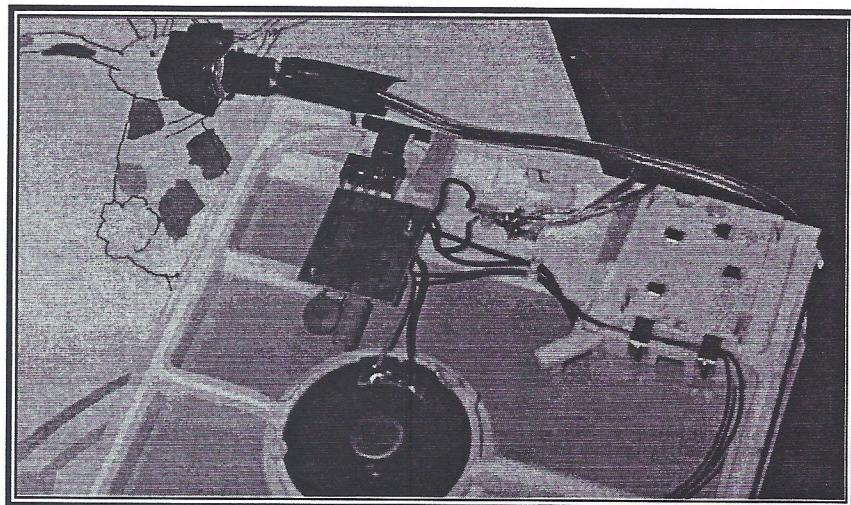
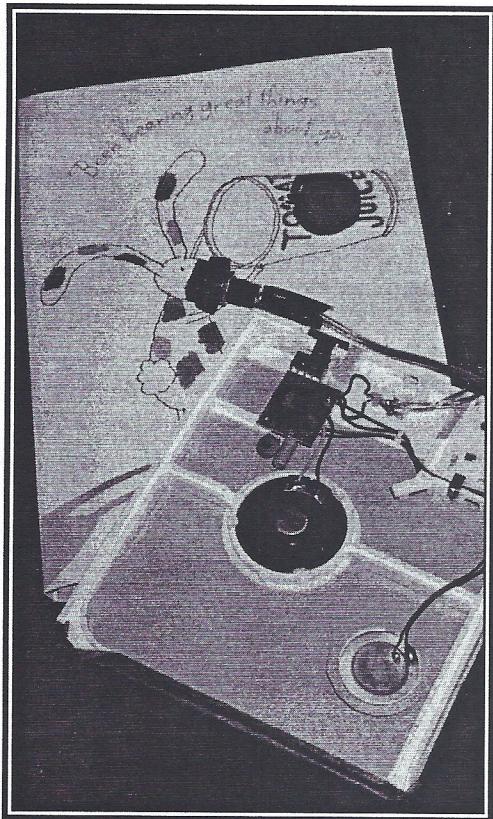


3. Use two battery-operated tape players to establish a basic closed-loop tape communication system. Attach switches to the remote jack on each recorder (you may need a *RADIO SHACK* sub-mini phone plug adapter to fit). Use two 15–30 second closed loop answering machine tapes. Record the message. When the user pushes the switch, the message will be spoken. Tape rewinds automatically.

- ▼4. Adapt a *HALLMARK™* recordable greeting card to serve as a message device. You can add an external single-switch to the card for easy access. To adapt the card, remove the recording/playback device from the card. Move the small speaker up closer to the recording/playback unit, and hot-glue in place.

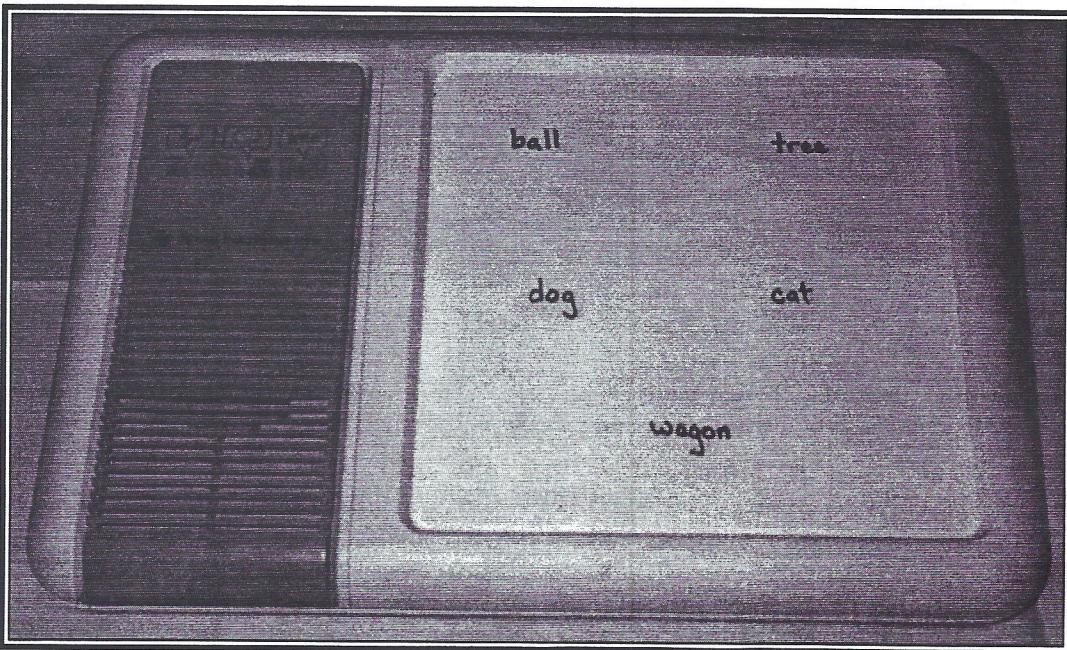
Locate the small push-button on the side of the recording/playback unit. Visually follow that push-button towards the recording/ playback unit until the two metal "legs" that the button press against and release to operate the playback function are located. Separate the metal legs, and solder one piece of 22 gauge wire to each leg.

Wire a jack on the other end of the 22 gauge wire, and plug in a switch. It's ready to record and play back any short message. House the adapted card in a plastic or cardboard box (the plastic cases for CDs and some video game cartridges are of appropriate size). Poke holes in the case above the speaker so the message can be heard.

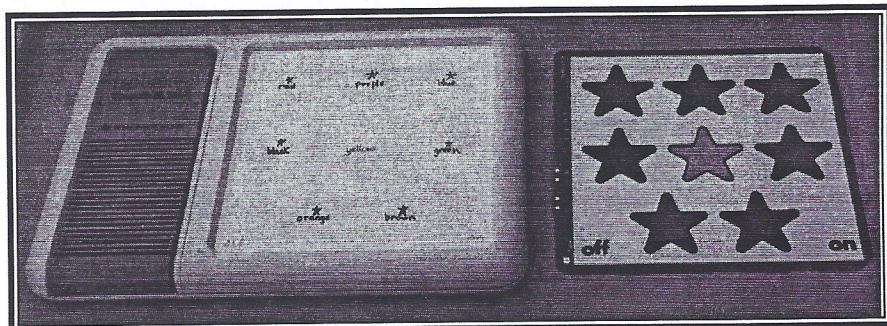
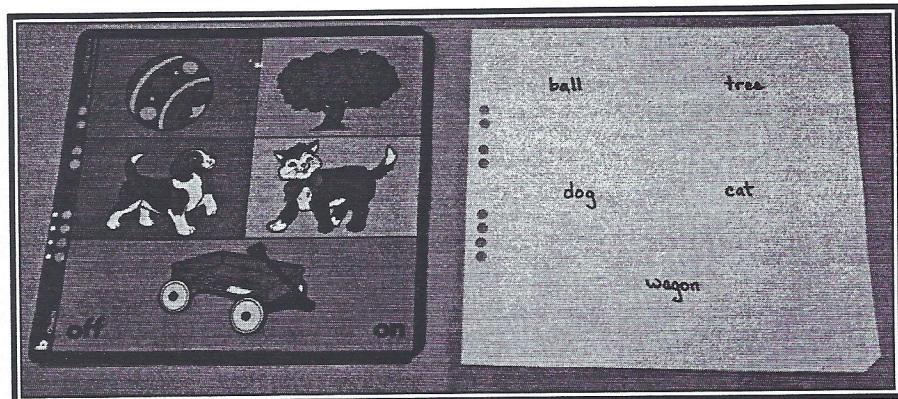


5. Word overlays can be designed to accompany the picture overlays for the *TEXAS INSTRUMENTS Touch N Tell™*. This simple modification can be used to promote beginning literacy through sight word recognition. ▼

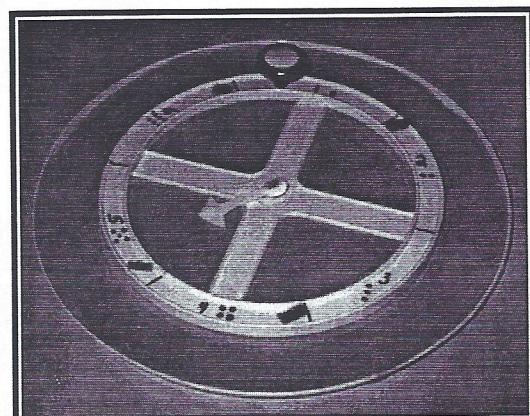
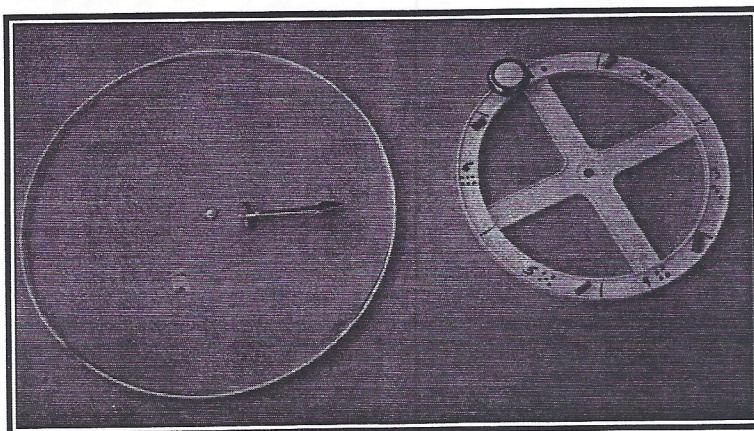
Remove the desired overlay from the *Touch N Tell™*. (See directions on back of the unit for removing overlays.) Trace around the overlay on a sheet of paper, and cut out. Holding the old overlay on top of the new one, use a paper punch to make holes in the appropriate places on the new overlay. On the new overlay, write the words that cor-



respond to the pictures on the old overlay. Make sure to write each word in the corresponding location as the original picture. Put the new overlay on the *Touch N Tell™* and the user is ready to activate the device and identify words rather than pictures.

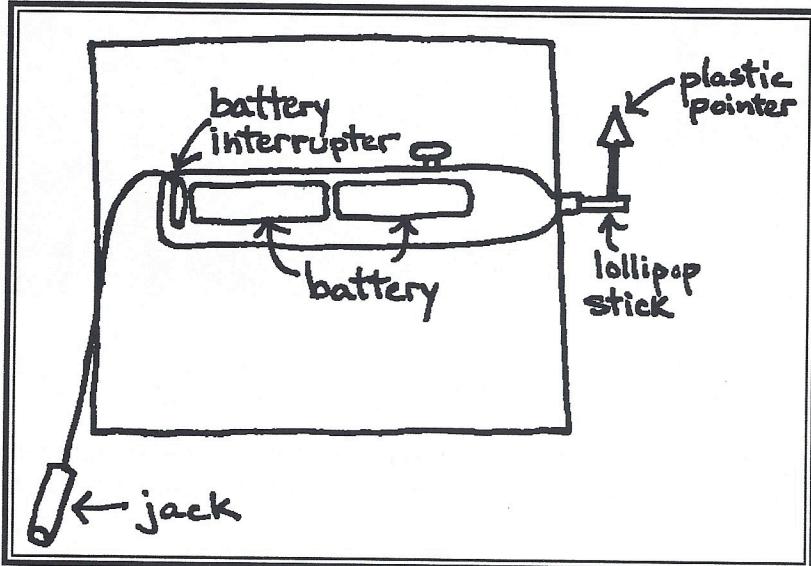


6. Use a squeeze flashlight, or a penlight, to direct a user's attention to a symbol or an activity. This strategy works well to teach eye-gazing, and it's an easy cue to fade.
7. Use squeakers (available in any craft store) to get a user's attention, or to direct a student to look in a desired direction. They're small and easily fit in a pocket, so they are always available.
8. Home-made spinners can be used to allow students to participate in board games requiring a spinner. They can also be used to randomly choose a classmate to answer a question or to be a partner. Remember: Spinners are different from dial-scanners in that they allow for random selections, not specific choices. A spinner can be made from a variety of materials; two possibilities are presented below.
 - ▼ a. **Lazy Susan Spinner** – A spinner can be constructed from a plastic lazy susan (the type used to store spices or other items in kitchen cabinets). Make sure the lazy susan has a cross-beam ("X") construction on the back. Snap off the small circle with the cross beam. Attach a small straw tubing to hold the spinner. Attach a cabinet knob to the cross-beam of the lazy susan, close to the outer edge. Construct "overlays" that fit in the "ring area" of the lazy susan. The overlays should represent the types of choices you wish the user to make or that correspond to the board game. The user can operate the spinner by grabbing or pushing the knob, causing the lazy susan to spin.

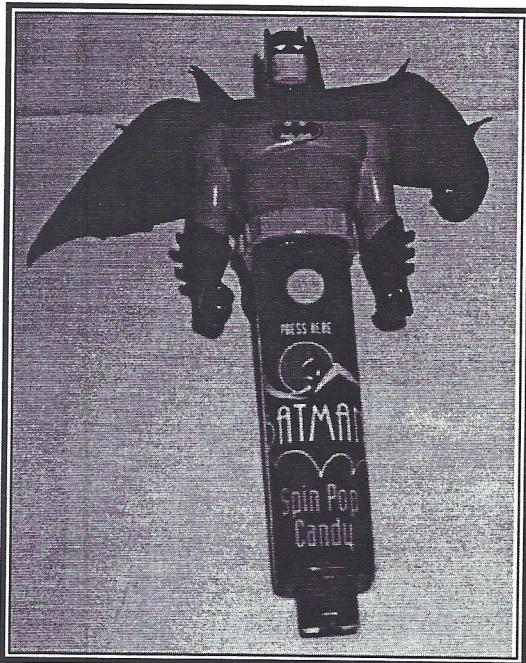
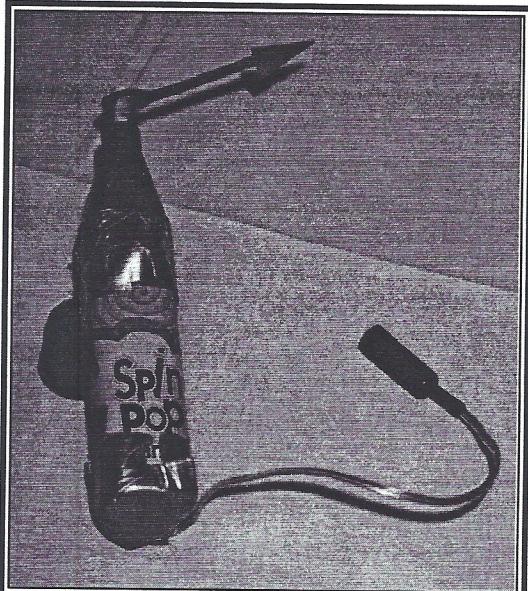
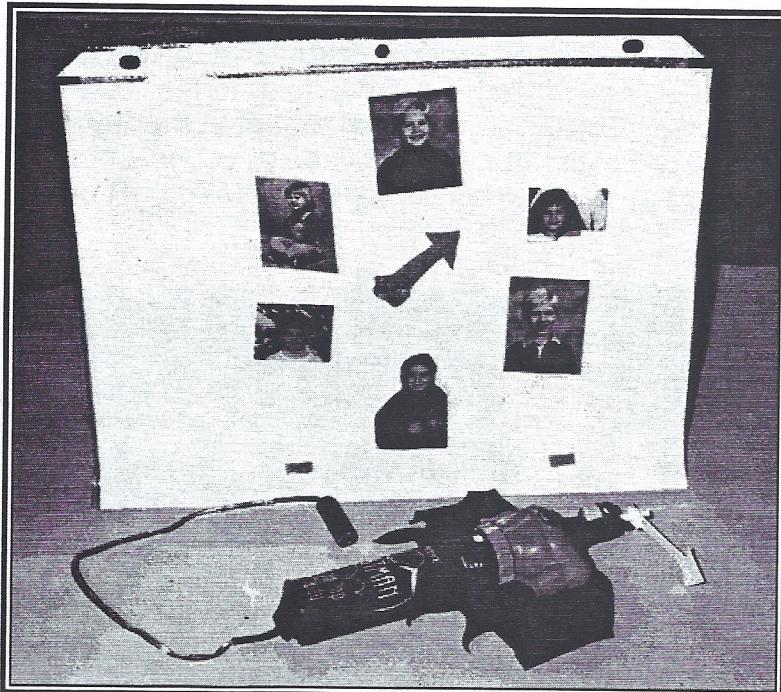


►b. **Lollipop Spinner** — A battery-powered spinner can be constructed and attached to a single switch to permit the user to activate the spinner. A *Spin Pop Candy™* toy, a battery interrupter of appropriate size for AA batteries, duct tape, a plastic lollipop stick, a plastic pointer, and a shoe box are needed for this activity.

Insert the battery interrupter in the end of the battery compartment. A small notch may need to be made to permit the battery interrupter cord to exit the compartment. Firmly tape down the on/off button on the *Spin Pop Candy™* toy, using duct tape. Insert the lollipop stick into



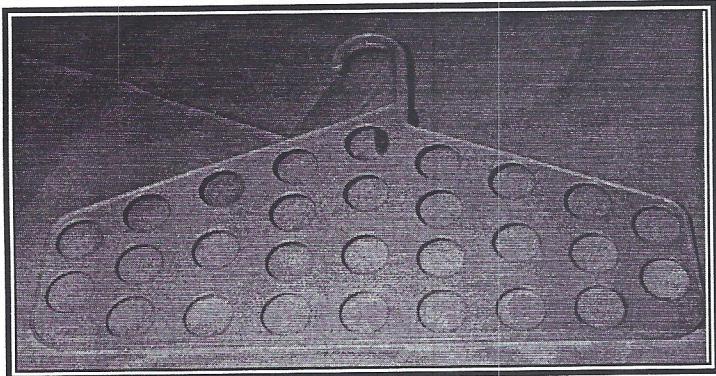
the end of the *Spin Pop Candy™* toy. Cut the stick to the desired length. Mount the *Spin Pop Candy™* toy inside the shoe box, with the lollipop stick protruding from the front of the box. It may be necessary to use foam scraps



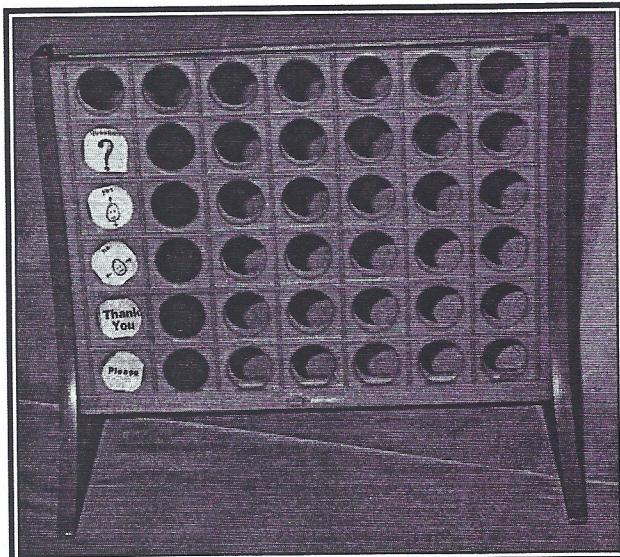
or cardboard to construct a "platform" inside the box to hold the toy securely. Attach the plastic pointer to the end of the lollipop stick.

Make overlays for the front of the shoebox that correspond to the choices the user is to make. The overlays can include numbers, colors, pictures of classmates, game board pieces, etc. The user can then use the spinner to participate in board games and other activities.

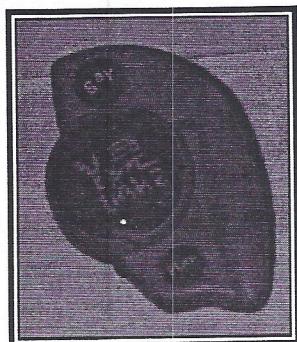
A participant in one of the authors' workshops suggested using a *Wrist Pop Spin Pop Candy™* toy for the spinner. This type of candy spinner is flatter and may mount more easily inside the box. Try it!



9. A *Scarf Hanger*® can be used as a template for a communication board. Simply place pictures or icons within each "cell" of the scarf holder, and attach the holder to a piece of tag board.



10. The frame from the *Connect Four*™ game can be used as a "stand-up" communication board or choice making device. Attach pictures, photos, or icons to the game pieces, and slide into the game frame.

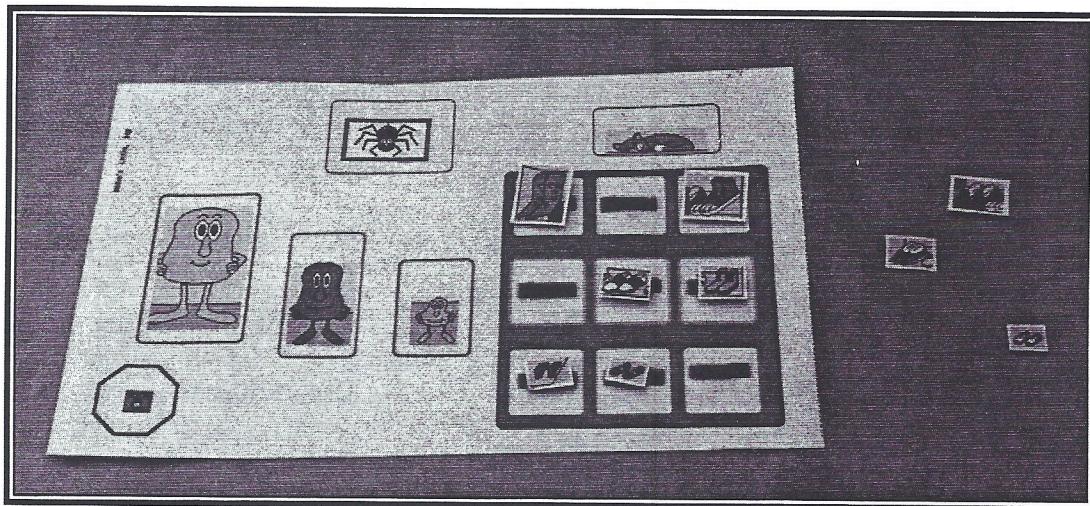
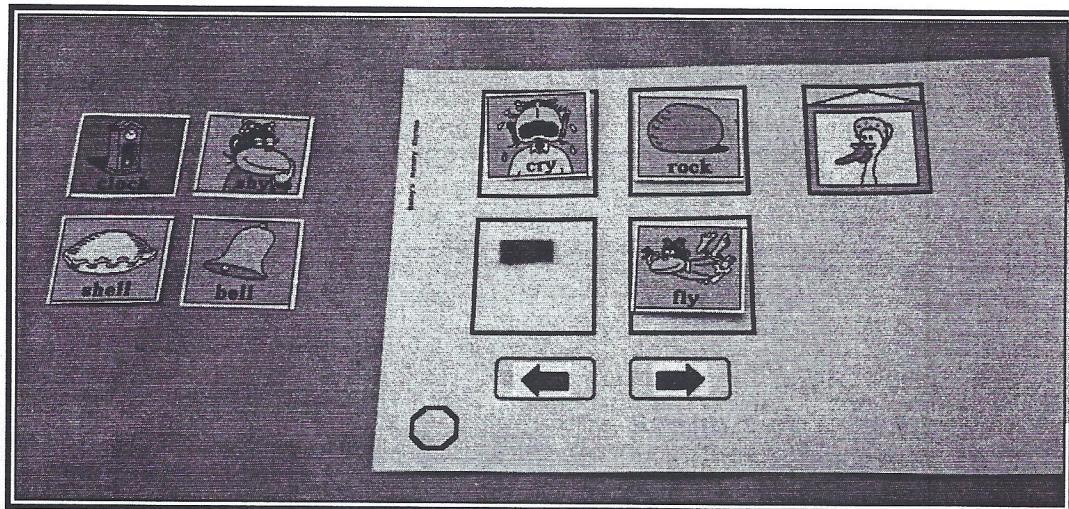


11. The *Yak Bak*™ and the *Yak Bak 2*™ devices work effectively as single-loop tape players. Both devices will store a 6 second message. The *Yak Bak*™ permits the person to record a message, and to press the button to play it back. The *Yak Bak 2*™ has a "lock" feature, which permits recording and saving the message, so that it cannot be changed without "unlocking" the device.

For both of these devices, the playback button will need to be enlarged for easier access. A pencil eraser, small super ball, or other type of material will work well to change the configuration of the button.

12. When constructing overlays for *Intellikeys™*, *Key Largo™*, or *KE:NX on Board™* to accompany specific software programs, consider using *Velcro™* when the software activity remains the same but the stimuli change. For example, an overlay for the rhyming activities in *Bailey's Book House™* (*EDMARK, INC.*) uses *Velcro™* to permit easy interchange of stimuli pieces as the rhyme changes. This type of strategy permits the use of only one overlay for an activity in a program and just interchange pieces, rather than making individual overlays for each rhyming possibility presented by the activity.

Another example uses the *Millie's Math House™* (*EDMARK, INC.*) activity which focuses on size (Big, Middle, Little). In this example, the stimuli pieces have *Velcro™* attached to permit moving the pieces as the software program presents a new size discrimination activity.



Chapter Three: General Low-End Technology Ideas Using Off-the-Shelf Materials and Toys

One of the most creative aspects of low-end technology is to begin to look at off-the-shelf products and commercially-produced toys and devices in a whole new way. When shopping, begin to look at products in terms of what they might be used for, rather than what they were designed for. It gives a whole new outlook to shopping!

This section of the book focuses on innovative and creative ways to use off-the-shelf products to provide access to school, home, and community activities. For example, adapting a joystick using a plastic squeeze dog toy, or enhancing the mouse button using a plastic door stop are some possibilities for low-end technology modifications. Suggested items for stimulating vision and other sensory responses are included, as well as commercially-produced toys that require little or no modification.

This section also looks at simple modifications for off-the-shelf toys and devices, as well as modification of battery-powered toys and devices for easier access. Please remember to refer to Chapter One for detailed instructions on modifying battery-powered toys and devices.

Using leftover junk and parts to design general low-end technology devices and strategies to facilitate access to typical activities is also addressed in this section. The ideas presented here represent only the "tip of the iceberg" in terms of general low-end technology design and creation. So let the imagination run wild, and use these ideas as a starting point for great low-end technology adaptations.

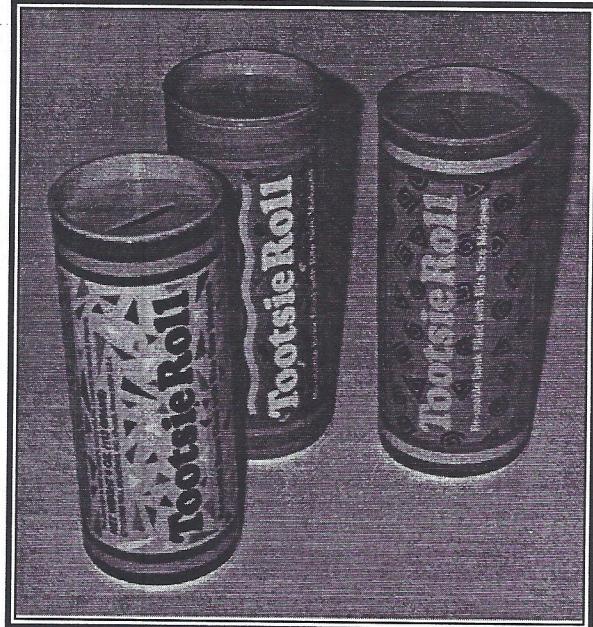
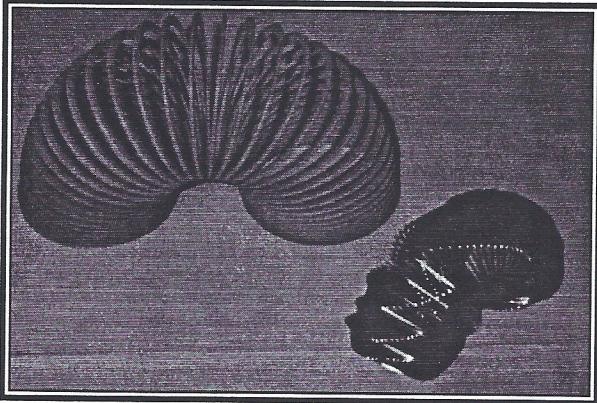
Ideas for Stimulating and Enhancing Vision

When gathering items which will stimulate and enhance the development of visual skills, consider items in the following categories:

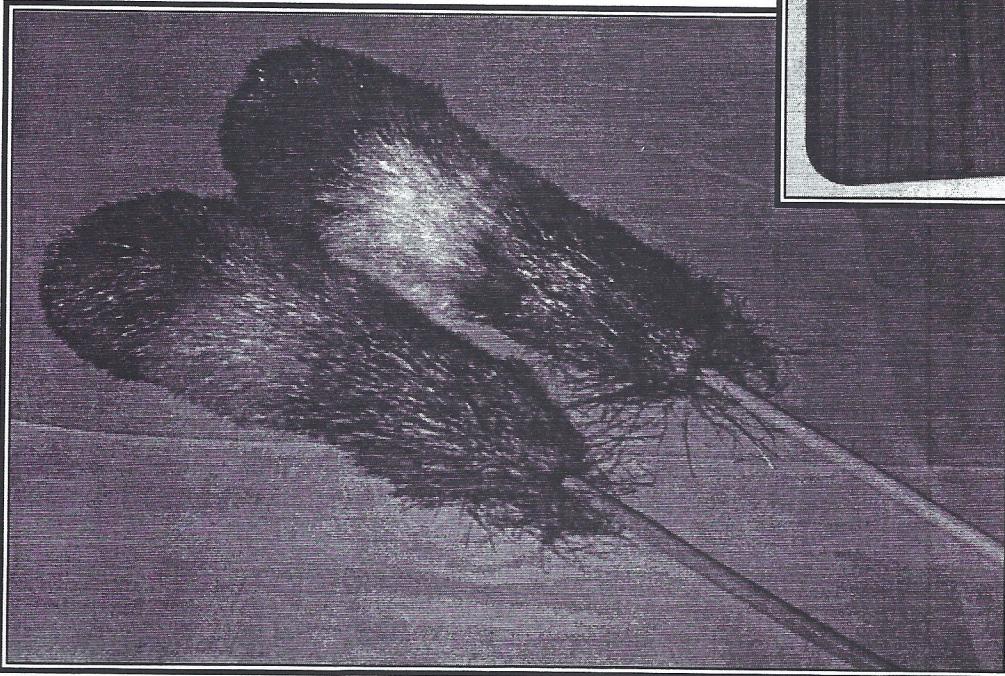
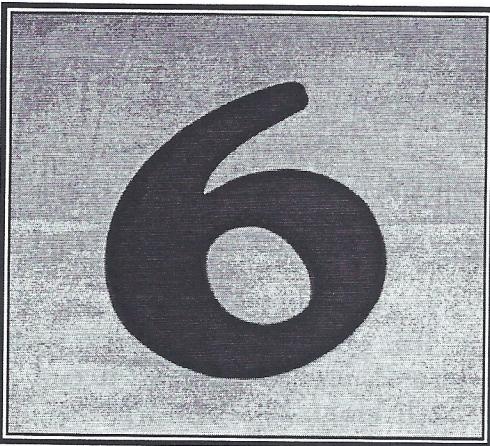
1. LIGHTS — Flashlights, lighted spinning tops, miniature Christmas tree lights, star flashlights, lighted musical wands, *Boo Bunch Lite Up Safety Wand™*, flashlights with colored caps, the *Simon™* game, etc.
2. REFLECTIVE ITEMS —
 - Tinsel wigs, reflective stickers, windsocks, reflective notebooks, glitter letters, reflective yo-yos, reflective pens and pencils, reflective house/mailbox numerals and letters (*Reflectives™*), etc.



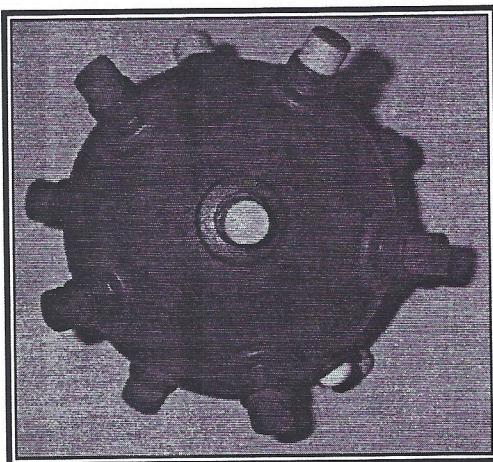
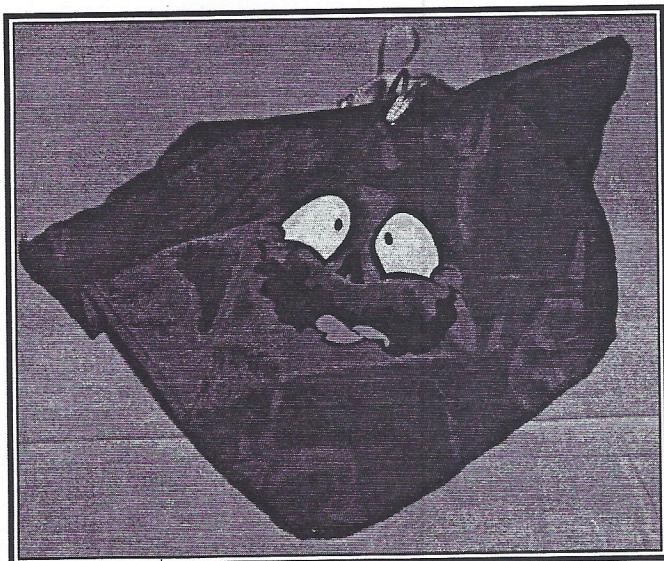
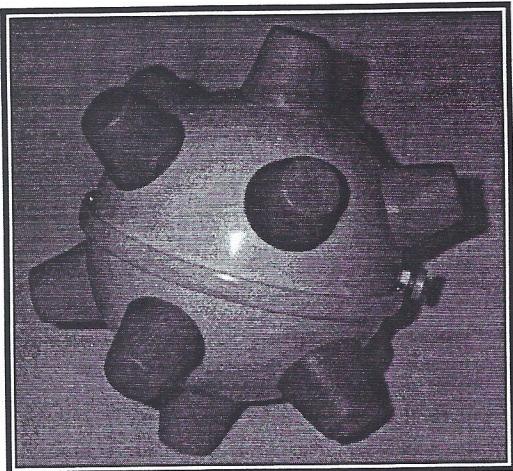
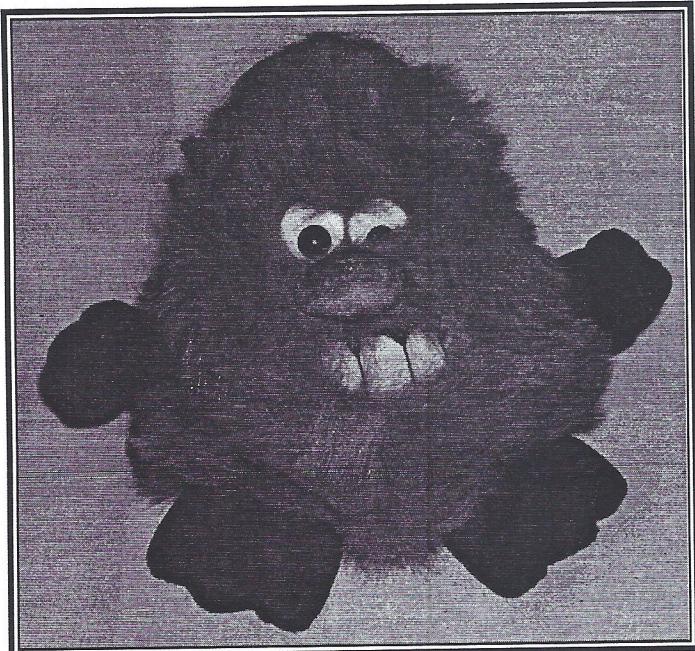
3. BRIGHTLY COLORED TOYS — *Slinkys™*, neon tennis balls, *Color Whirl Whizz Play Set™*, *Neon Dry Marker Board™*, *Ka-Boing Ball™*, *Melotone Rap Machine™*, *Tootsie Roll™* bank containers with bells and other items placed inside the containers, etc.



4. OTHER SENSORY INPUT — Different textures, hairdryer, *Pleasure Puff™*, dusters, clay, lotion, shaving cream, sandpaper letters, large house letters and numerals, large foam letters, vibrating pen, texture ball, etc.



5. ▼ MOVEMENT & SOUND — Wind-up toys, musical keyboard, *Bumble Ball*™, sound activated toys such as *Boo Bunch Strobie Ghoulies*™ and *Goofy Goblin*™, switch-accessible race car, musical yo-yos, *MusiCrayon*™, *Squiggle Ball*™, etc. ►

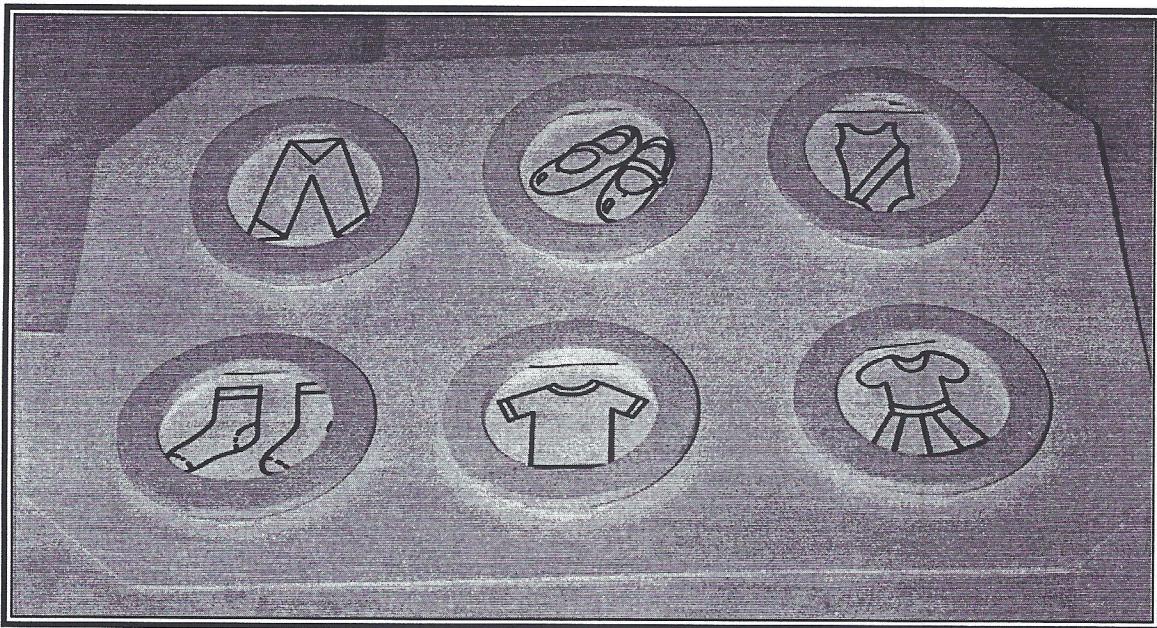


6. ▲ ADAPTATIONS THAT ACCOMMODATE VISION — Colored glue, *Hi-Marks*™ *Marking Glue*, neon and brightly colored sandpaper, *Velcro*™ dots, felt dots, *Puff Paint*™, *Crayola*™ *Scented Markers*, *Crayola Magic Scent*™ *Crayons*, *Crayola Glitter Crayons*™, etc.

ORIENTAL TRADING COMPANY is an excellent source for all types of vision stimulation and vision enhancement materials. Check the **Resources** section for complete address.

General Low-End Technology Ideas Using Good Junk and Off-the-Shelf Products

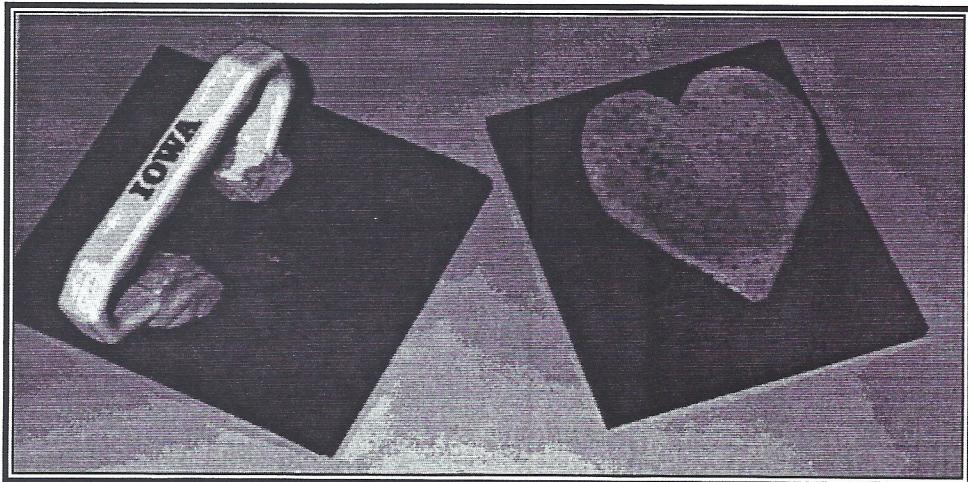
1. Colored glue can be made by placing the felt tips of colored, washable markers in a container of white, washable glue. Let the glue stand overnight, remove the marker tip, and an ample supply of colored glue is ready to be used. Adjust for color intensity by adding more than one marker tip.
2. Use foam coaster rings on overlays for *Intellikeys™*, *PowerPad™*, or the *TouchWindow™* to ▼ provide a tactile prompt for key location.



3. When running software programs that require the use of specific keys, use stick-on, disposable "earrings" to mark the keys. The "earrings" are small enough that they will not totally occlude the letter markings on the keys, and they provide a tactile prompt as well.
4. Provide improved visual contrast for children with visual impairment or figure-ground difficulties by covering the keys with bright yellow price marker stickers with the letter written in black ink. This adaptation works well for both standard keyboards and nonstandard keyboards, such as *Muppet Learning Keys™*.
5. For sponge painting activities, consider using a variety of strategies to make this activity more accessible.

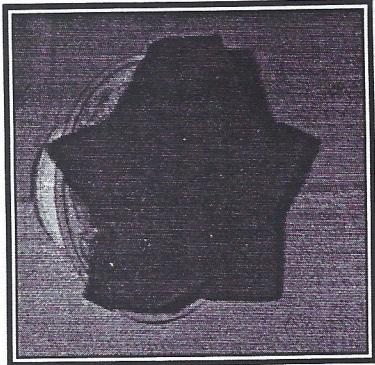
- a. Mount the "sponge" on a small square of wood, and attach a plastic cup handle to the back of the wood.

In the photo below, foam shoe insoles have been used to provide texture for the sponge painting activity. ►

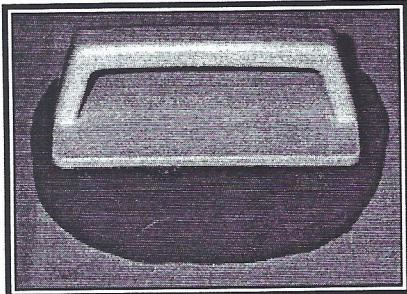




- b. Mount the sponge on a *Scrub Bob*™ dish scrubber. Just cut off the nylon mesh and hot-glue the sponge to the scrubber handle.

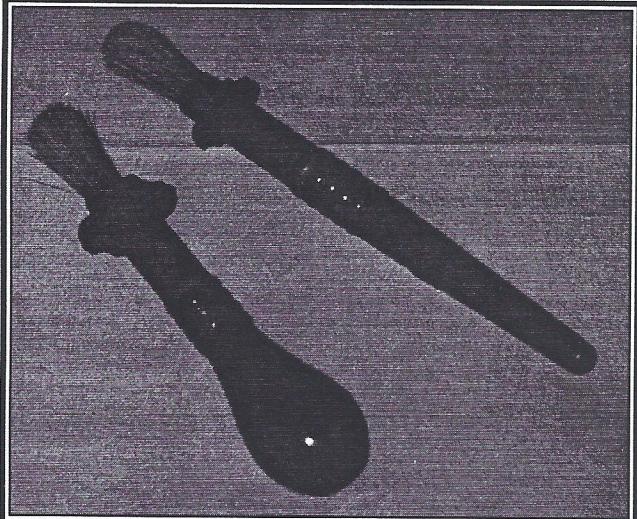


- c. Mount the sponge on a grill scrubbing tool. Cut the nylon fiber off the scrubbing tool, and hot-glue the sponge onto the scrubbing tool surface. This type of tool provides a large handle to facilitate painting.

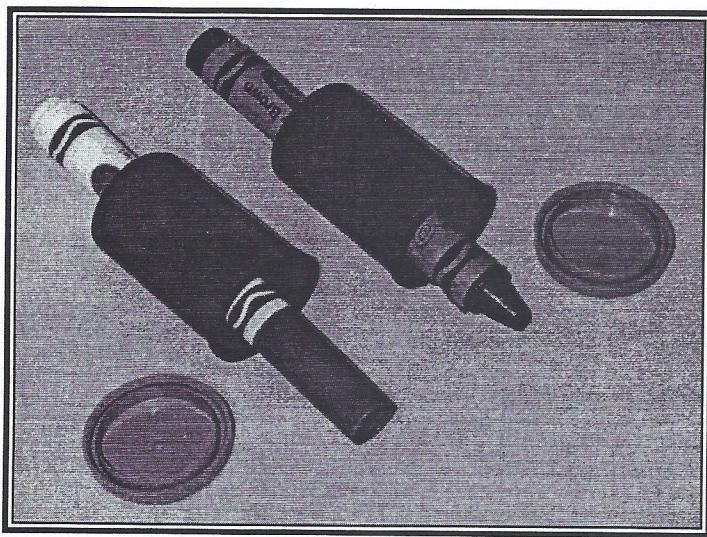


- d. Use a *DuraMitt*™ as the foundation for mounting the sponge. This type of *DuraMitt*™ is designed for scrubbing floors and ovens, and has the tightly woven nylon fibers as its surface. This surface adheres well to *Velcro*™ strips placed on the backs of the sponge, making the sponge shapes interchangeable.
6. Create a tactile, 3-dimensional keyboard overlay for *Intellikeys*™ using letter and numeral erasers. Simply hot-glue the erasers to tag board in a Qwerty or Alphabetical keyboard format, and you're ready to go.
7. Construct a "permanent" mouse house from a *Karton Kooler*™ (drink box holder).
8. Use *Multi Purpose Gripper Pads*™, *Little Nipper Gripper*™, or *Easy Liner*™ in place of *Dycem*™ to hold switches, keyboards, slanted items, toys, etc., in place. Rug gripper mats, cut to fit these items, also work well.

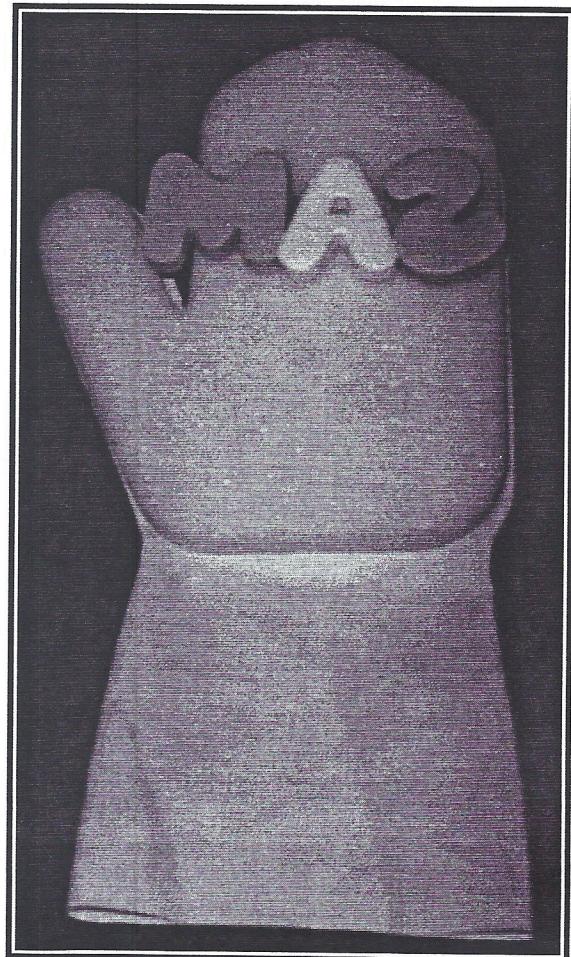




9. Look for large handle paint brushes to facilitate a user's grip. Enlarged handles can be added to paint brushes by filling a balloon with white, fine-grain sand, and inserting the paint brush handle into the balloon. Secure the balloon to the paint brush with duct tape.



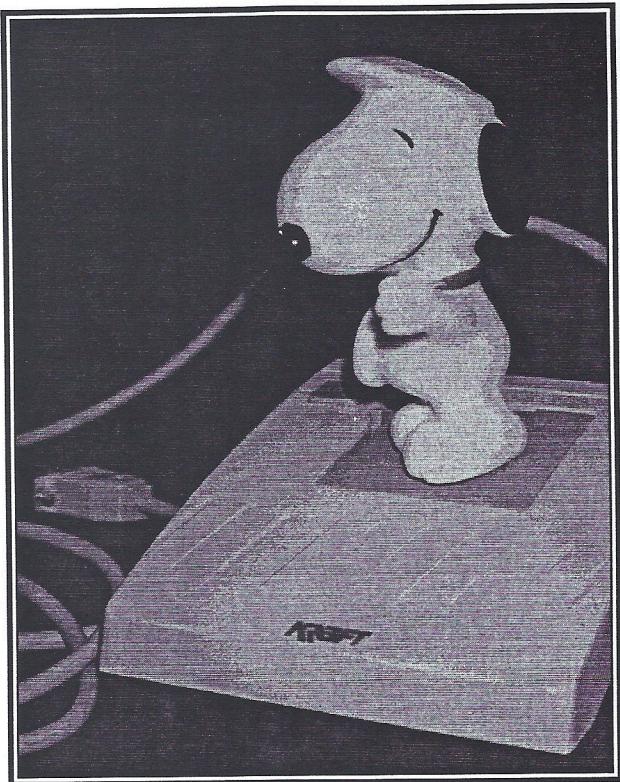
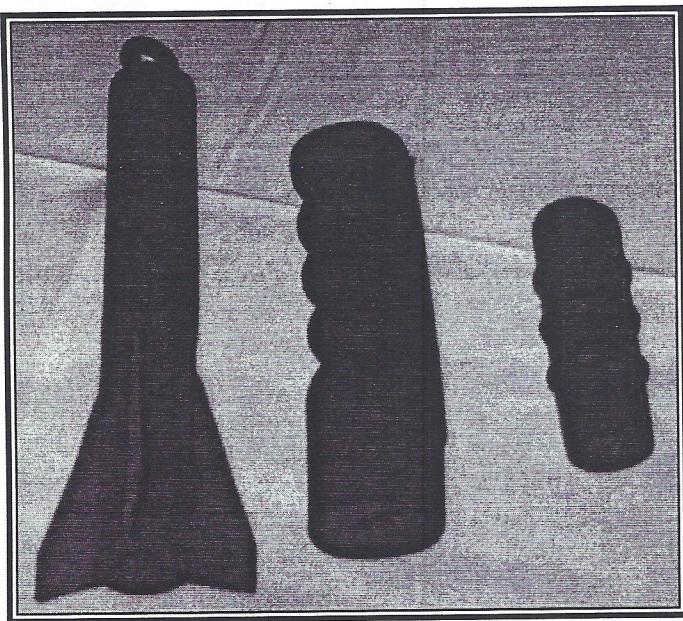
10. Enhance the user's ability to grasp a writing or drawing tool using 35mm film canisters. Cut an "X" in the bottom of the film canister, and slide the writing or drawing tool through the canister. This adaptation will work for any size tool. The user can hold the writing or drawing tool in a modified tripod grasp or in a palmar grasp.



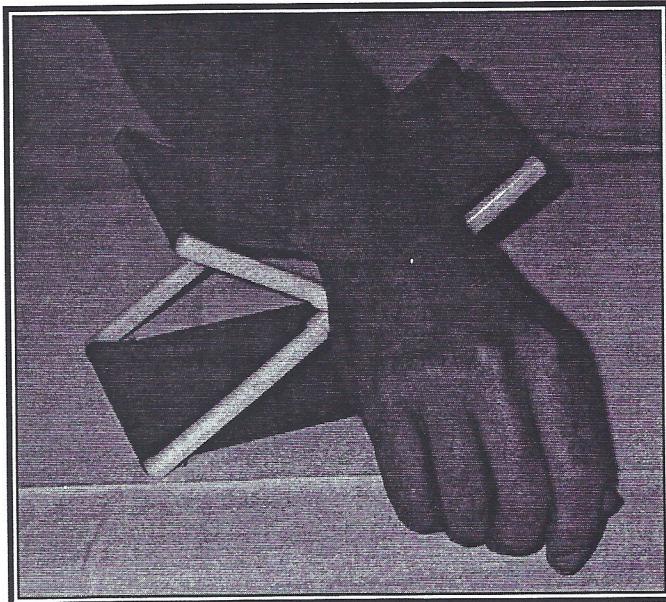
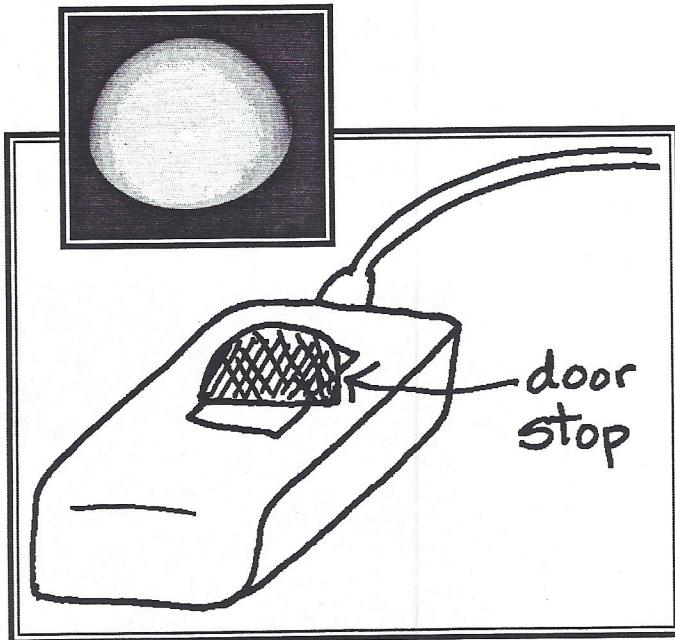
11. Give a user access to "printing" his/her name by attaching foam or rubber letters on a *DuraMitt™*. The user can slide the mitt on his/her hand, then press the letters on an ink pad, and then press on paper to print his/her name. Remember to place the letters on the mitt inversely!

12. Use picnic *Table Cloth Clamps®* to keep items secure on a slant board. This type of clamp has a wide opening and holds items securely.

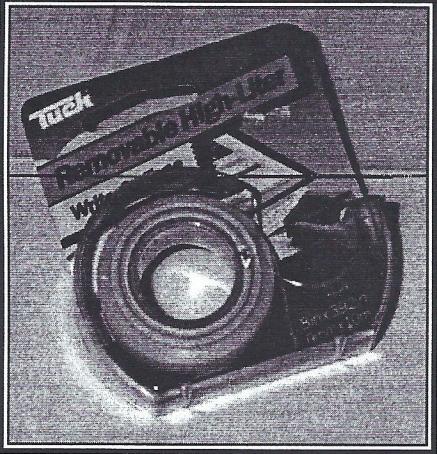
13. Adapt any joystick using bicycle handle bar grips, *Nerf™ Ammo Hydro Torpedoes*, or a soft plastic dog or cat squeeze toy. ►



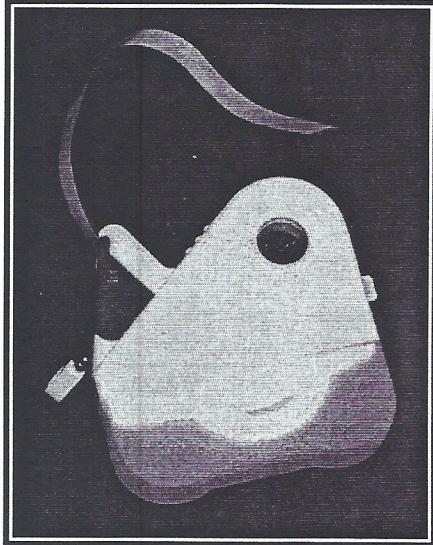
14. Use a *Beach Head Rest™* as
► a wrist support to facilitate
keyboard use. This device
works well for users who
have trouble holding their
forearms in a steady position
for successful keyboard use.



15. Use a rubber wall-mount
◄ *Melard Door Stop™* as a
device to enhance the
mouse button. Attach the
doorstop to the mouse
button using *Handi-Tak™*
for easy removal.

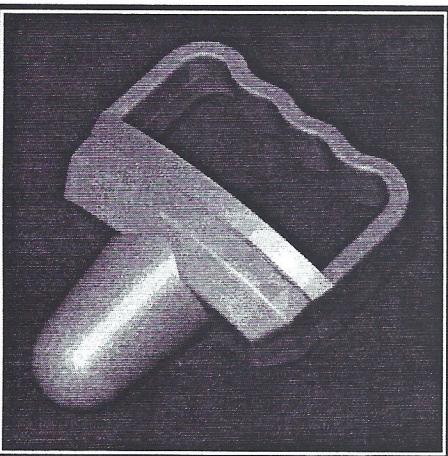


16. To highlight text in a temporary manner, ◀ use *Tuck™ Removable High-Lighter*. This removable tape is available in basic neon highlighter colors and works effectively to temporarily highlight important text for the user.

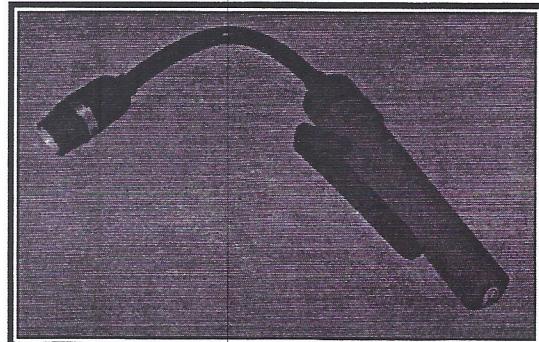


17. For a user who has difficulty manipulating tape or glue, use *Pentel™ Rolling Tape*. The "sticky" substance rolls off the tape, which is housed in a light-weight, easy-to-hold dispenser. ►

18. To help hide cords from computers, switches and adapted toys, purchase a *First Years™ – Hide Away Cord Shortener*. The cord shortener comes with *Velcro™* that adheres easily below a lap tray, table surface or in any other spot.
19. A cord "shortener" or "hiding place" can be made out of a plastic travel toothbrush holder (the cylindrical type). Use a utility knife to cut a $\frac{1}{2}$ " wide and 2" long slot in both halves of the toothbrush holder. Fold the extra cord and slide it into the holder. When the holder is put together, the extra cord is stored inside the holder.
20. Use thick plastic straws or plastic tubing to facilitate a user's ability to turn a toggle switch on and off. Tie a large loop knot in one end of the straw, and slip the other end over the toggle switch. The user then pulls/pushes the knotted end of the straw to turn the switch on and off.

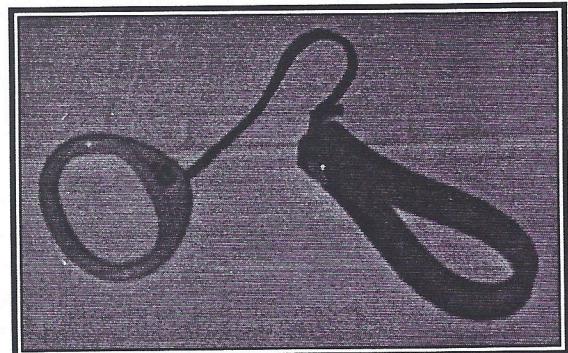
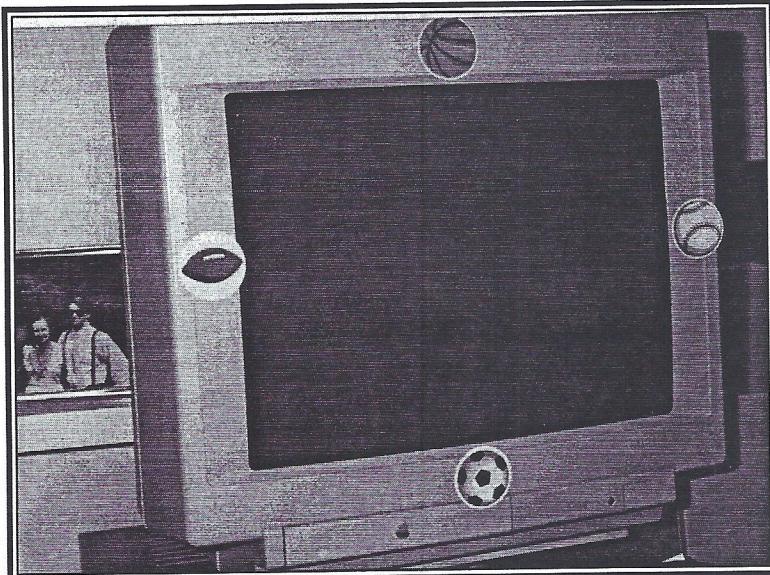


21. To assist in using a standard keyboard, ◀ consider using the hand-grip portion of the *Mighty Morphin Power Rangers™* *Ivans Ooze Knuckle Extruder* as a key tapping device. Slide the hand grip portion on the user's hand, and then the user can access individual keys on the keyboard more easily and accurately.



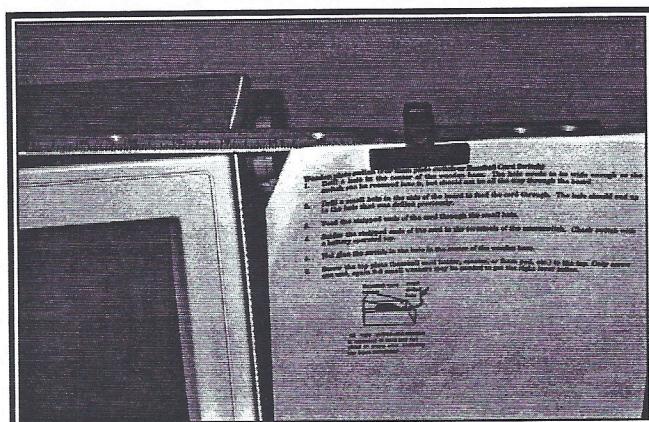
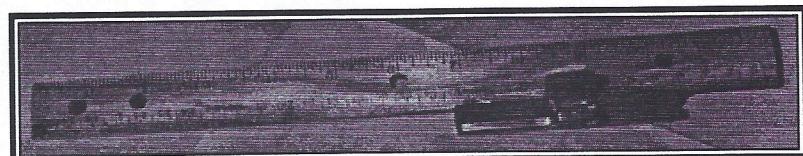
22. Consider using the *I.N. Gear Field Light™* as a training device for a user who will use an infrared communication device or an eye gaze system. The *Field Light* clips onto the bill of a baseball cap, or onto a headband, and has a flexible neck permitting the angle of the light to be adjusted.

23. Use sound book strips to support a user's participation in the classroom retelling of a familiar story or a class play. Look for these sound book strips in discount and dollar stores. They are sold without the book attached, so students can write their own stories to correspond to the sounds and pictures. The addition of one-half of a superball glued onto the sound squares makes the buttons easier to depress.
24. Use a *Pull Pal™* door opener to eliminate the need for a user to grasp a door knob and turn it to open the door. The loop is placed around the knob of the door. The user pulls down on the handle and the door knob turns. The user then needs to push or pull the door to complete the door opening process. ►

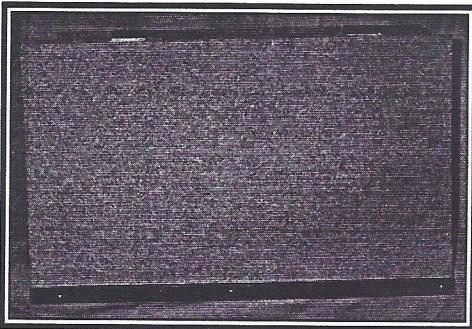
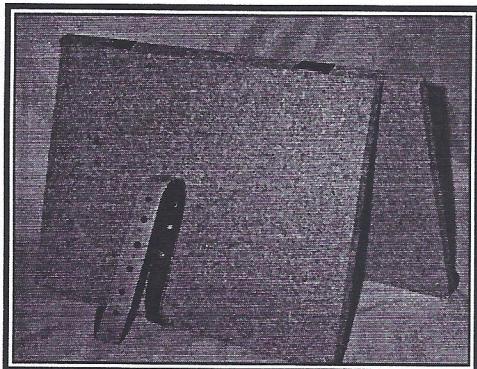


25. For users who have difficulty remembering the directionality of the arrow keys on a computer, concrete references to direction may help. Use stickers or erasers on the computer monitor and matching small erasers on the keyboard to indicate directionality. For example, a basketball corresponds to the "up" arrow, a soccer ball to the "down" arrow, a football to the "left" arrow, and a baseball to the "right" arrow.

26. For young users with limited vision, or limited visual attending skills, consider adapting children's books by providing a tactile referent to the location of the main character or a consistent animal or character. Use *Velcro™* dots, felt dots, hot-glue dots, puff paint, or any other material that makes a raised, tactile mark. This type of adaptation permits the user to "feel" where the main character or other consistent character is on the page and then use his/her vision to "look" at the illustration.
27. To promote independence at the computer where the user must refer to a printed document, construct a document holder for the computer. Materials needed include a 12-inch ruler, a "chip clip," and *Velcro™*. Determine whether the user needs the document on the right or left side of the computer. Hot-glue the chip clip to the ruler approximately 2" from the end. Attach *Velcro™* strips to the underside of the ruler and to the top of the computer monitor. Attach the ruler to the computer monitor and insert the user's document in the chip clip. The chip clip will hold the user's document in an upright position, and the user will not need to continually look down to the desk surface and then up to the computer monitor. ►



28. **Portable Adjustable Slant Board** – Many users benefit from having materials placed at a slant, rather than lying flat on a table, desk, or wheelchair tray surface. Frequently, the appropriate angle to facilitate positive work changes as the user grows and develops. The slant board in the photographs below is easy to make and permits adjustments to be made in the angle of the slant to accommodate the user's needs.



To construct the slant board, gather two pieces of plywood of an appropriate size for the user, shoe board (to form the rail to hold papers or a device on the slant board), two cabinet hinges, an old belt, and a screw. Hinge the boards together at the top, and attach shoe board at the bottom of the front board. Remove the belt from the buckle and discard the buckle. Attach the "buckle end" of the belt at the center of the bottom of the front board.

Drill a hole in the back board approximately 4 inches from the bottom of the board. Insert the screw in the hole, making sure that $\frac{1}{2}$ " of the screw protrudes from the back of the board. Make additional holes in the belt to increase the angle adjustments possible. Hook the appropriate belt hole over the screw for the amount of slant the user needs.

Adapted Battery-Powered Toys and Devices

1. *Bed Bugs Game™* –
► This battery-powered game comes with colorful plastic "bugs." The purpose of the game is to use a pair of plastic tweezers and pick the bugs out of the bed while the bed vibrates. The game can be adapted using a battery interrupter so that the user can activate the bed by pressing a switch.

This game can be used for a cooperative learning activity by replacing all the "bugs" with small, black plastic spiders. The children could read *The Very Busy Spider* book by Eric Carle as an introduction to spiders. This book contains a tactile spider web on each page that is inclusive of children with visual impairments. The switch to power the game could be a push switch with a spider on it. The user could depress the switch to activate the bed while peers use the tweezers to catch and remove the spiders.

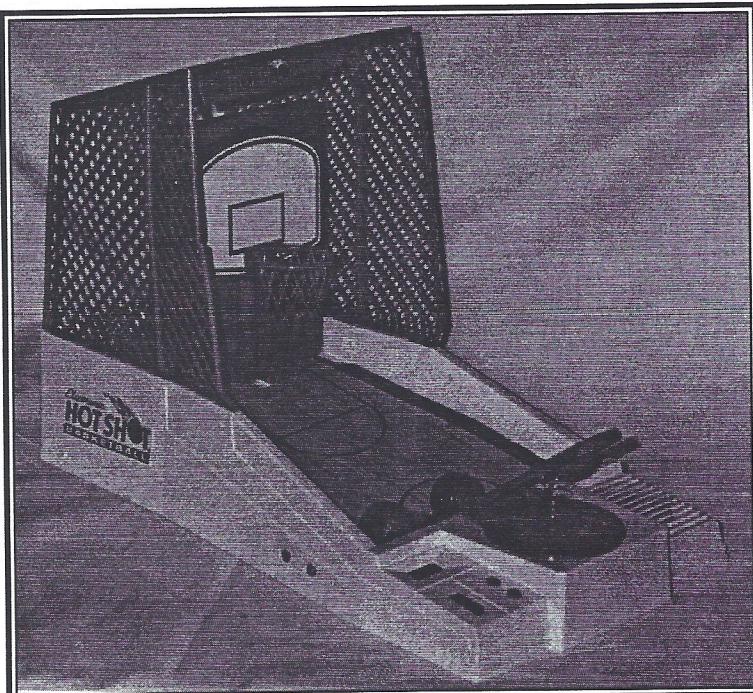




► For additional fun, students could play with the *Boo Bunch Jumping Spider*™. This battery-operated toy is a vibrating spider that is activated by touching the spider's body.

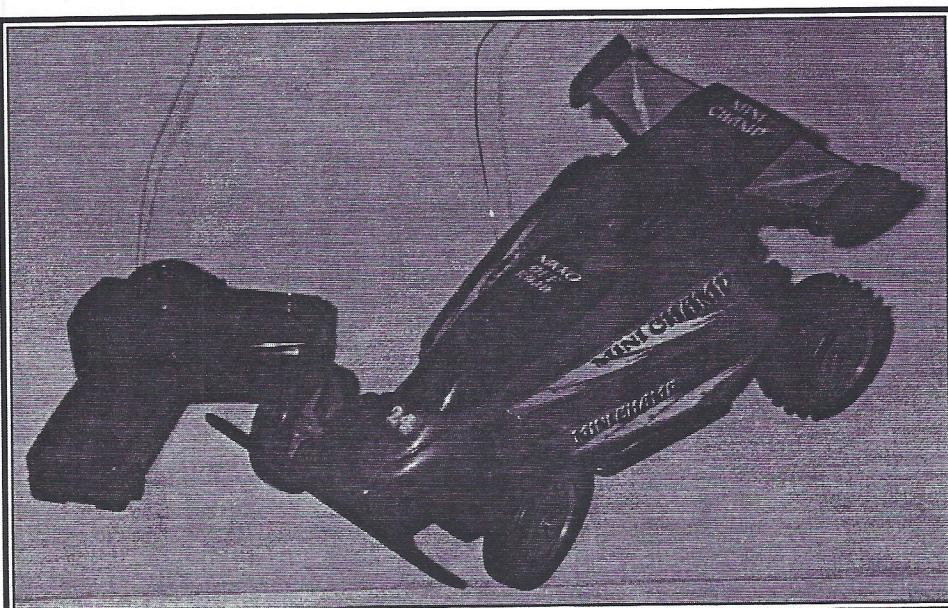
The same switch used to power the *Bed Bugs*™ game could be used to power the computer using *Circletime Tales® Eensy Weensy Spider* software.

2. *Hot Shot™ Basketball Game* – This game can be modified for two single-switches. The game has two separate functions that are battery-powered: One switch moves the basket forward and back; one switch plays the music that accompanies the game. The modified game can be played by three peers with the more able-bodied peer shooting the basket using the spring-loaded "shooter" at the front of the game, and the other peers controlling the motion of the basket and the music through the use of single switches.

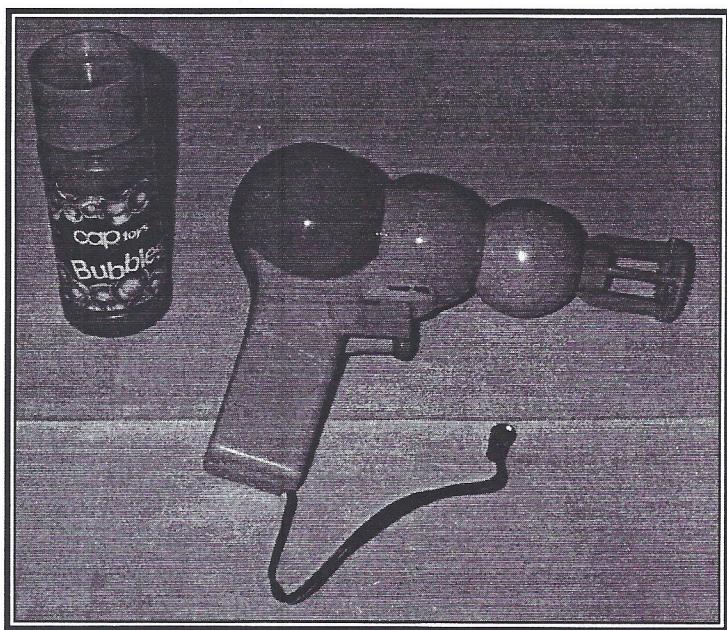


3. **Remote-Controlled Race Car** – This toy can be easily modified by rewiring the hand-held remote controller and adding a jack to provide access through a single switch. The location for the switch by-pass can easily be located inside the hand control by taking the cover off the hand control and depressing the trigger. Observe which two pieces of metal are touching when the trigger is depressed. These two points are the locations for your switch by-pass. (Refer to Chapter One for complete instructions.) ▼

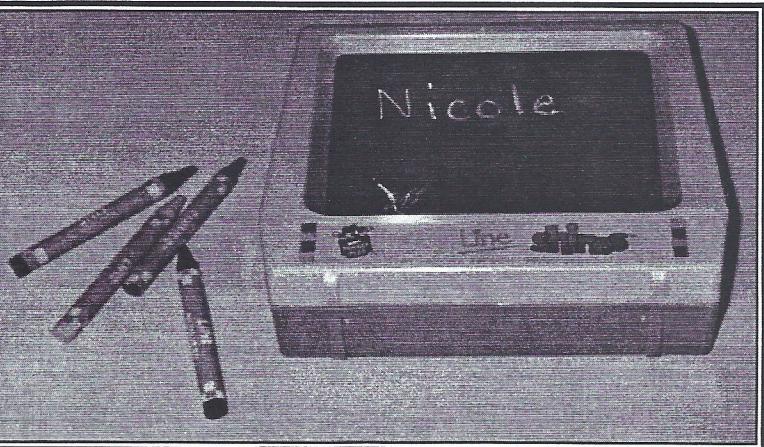
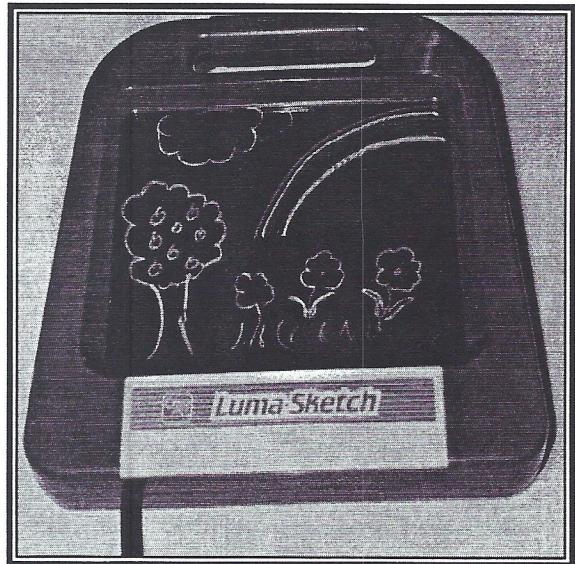
Reassemble the hand control, and plug in your switch. The car is now powered by the user accessing the single switch. This modification works best with a car that moves forward when the control or switch is pressed once, and moves backward and turns in reverse when pressed a second time. If the switch is not depressed, the car stops.



4. **Battery Operated Bubble Gun™ —** This toy adapts easily with a batter interrupter placed in the battery case and the trigger mechanism taped securely in the on position. When these modifications have been made, plug in the switch, and depress it to blow bubbles. ►

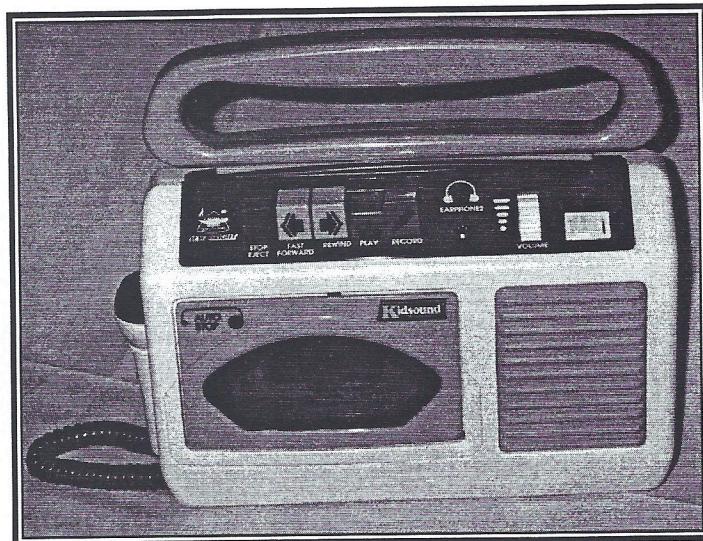


5. **Battery powered toys with small buttons —** Many toys can be adapted simply by enhancing the buttons the user must depress to activate the toy. For example, the *Boo Bunch Lite Up Spooky Tunes™* toy can be adapted by creating "levers" from popsicle sticks that are taped over the small buttons. The user can then push a lever to activate one of the four "spooky" tunes produced by this toy.



6. **Luma-Sketch™ —** The *Luma-Sketch™* is a battery-powered writing or drawing toy with a lighted background. The *Luma-Sketch™* can be modified with a battery interrupter or through rewiring the toy and inserting a jack to permit access through a single-switch. When the toy is adapted, the user can turn the light on using a switch. ►
7. **Line Shines Travel Pocket Play™ —** This toy is similar to the *Luma-Sketch™* and uses a fluorescent bulb to illuminate the drawing. It is smaller than the *Luma-Sketch™*, but can be modified through the use of a battery interrupter or through the installation of a jack to be switch accessible.

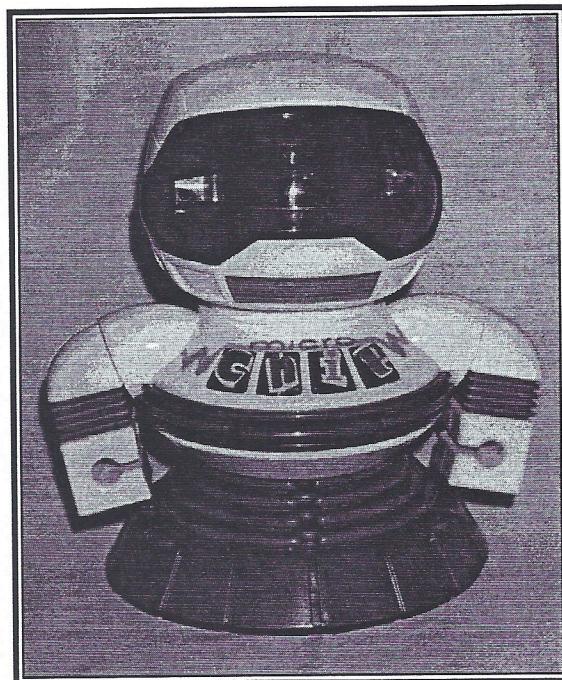
8. *Kid Sound™ Tape Recorder* — This fully functional tape recorder and player can be adapted by rewiring and adding a jack for single-switch access. When the switch is plugged into the tape player and the play button is depressed, nothing will happen until the user presses the switch. This is an extremely durable tape recorder/player and is brightly colored with large buttons to control the various functions.



Toys and Devices Requiring Little Modification

1. *Bump-N-Go Robot®* — This robot is a wonderful toy that requires no modification to be used by a single-switch user. The robot's head is one large single-switch that activates the robot to move. Since the robot is a bump-and-go toy, the robot will stop and change direction whenever it runs into a wall, rail, or other impediment. ►

The buttons on the robot's chest activate different sound and light patterns. They are easy to depress, but one-half of a small superball can be hot glued to each button, making access easier. Adding the superballs to the buttons would also facilitate the user's tactile discrimination of the four buttons.

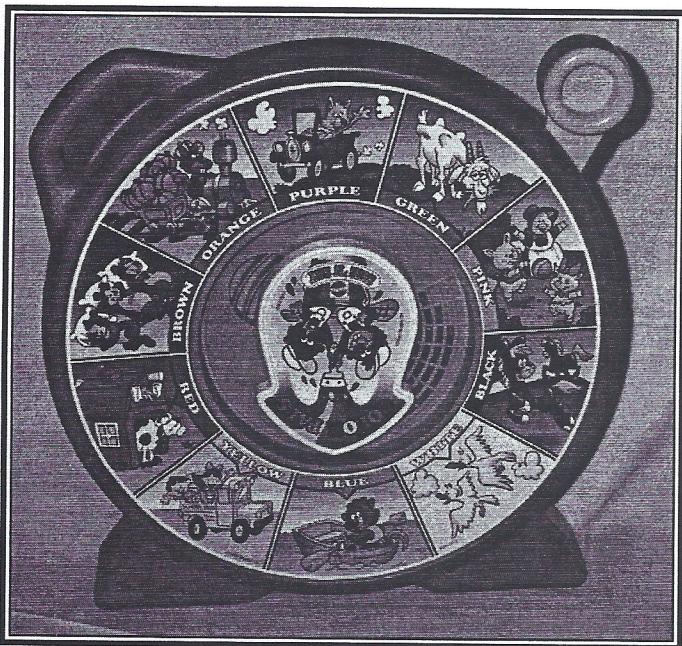
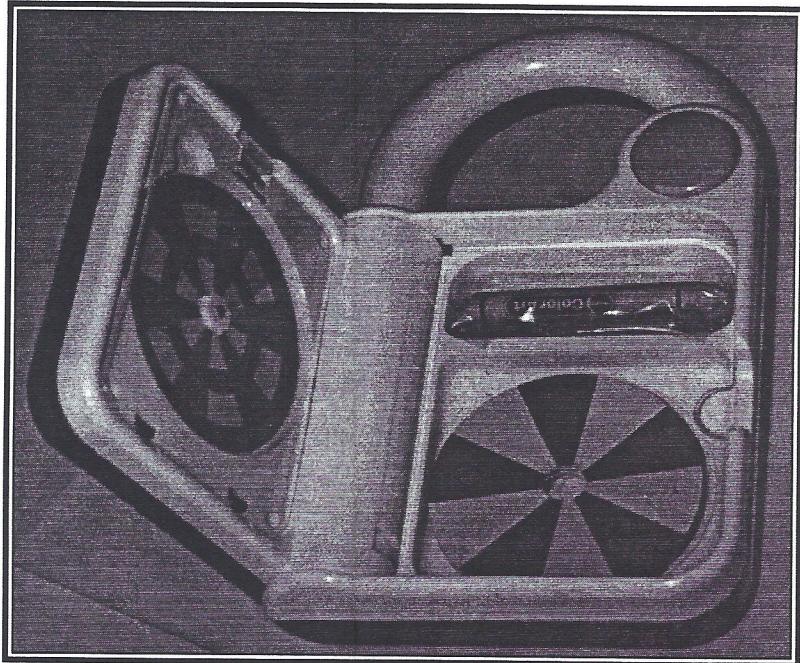


2. *Melotone Electronic Rap Machine™* — This toy permits the user to create rap rhythms by accessing the four large buttons. The toy needs no modification since each of the buttons is a relatively large, light-touch push switch. For users who require additional tactile prompts to discriminate among buttons, each button could have a different texture added to facilitate discrimination. ►

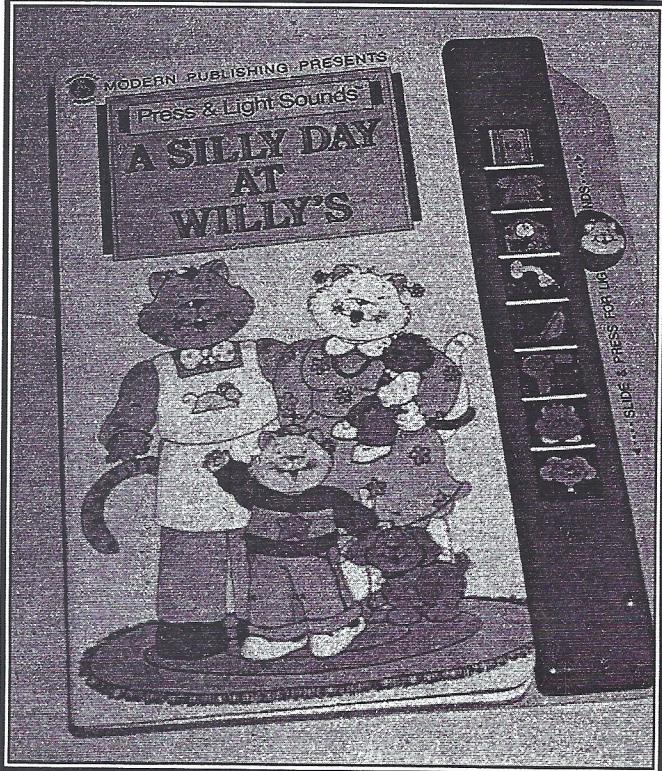


3. *Color Whirl Whizz™ Play Set* –
► The *Color Whirl Whizz™* has different patterned disks that are placed in the spinning compartment of the toy and activated by depressing the large yellow button at the top of the device. The button is a light-touch switch that is easily depressed. Each time a new color disk is inserted, and the toy is activated, a new color is created. For example, the disk that has a red/yellow pattern, when spinning, creates orange.

This toy can be used to predict which colors will produce what new color when the spinning is activated and can become a good predicting game for users who are learning to discriminate and mix colors.



4. *See 'n Say™* – This toy requires no adaptation since the string pull to activate the toy has been replaced by a large, easy slide lever. If the user cannot grasp the handle of the lever, a hole may be made in the handle and thin plastic tubing inserted in the hole to form a loop for the user to grab.

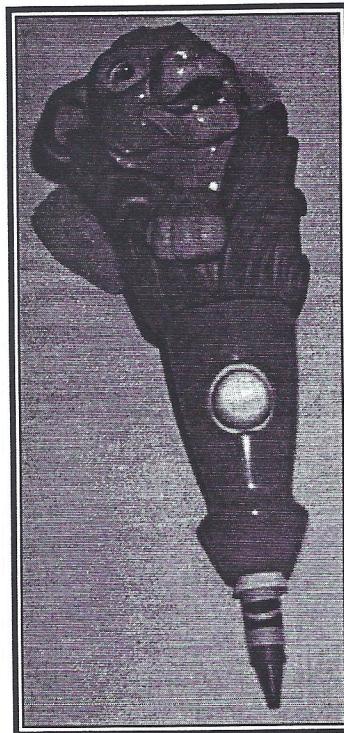


5. *Press & Light Sounds™* – These books are
► wonderful for cooperative learning activities. One user can slide the lever to the desired location while the other user presses the button, producing a sound that corresponds to the story. When the button is pressed it lights up the square that was chosen. Since the only sound activated is the one directly next to the button, this type of sound book eliminates incorrect or multiple selections when the user is not able to remove his/her fingers from the membrane "keys" on the board.

6. *Sound Scribblers™* — The *Sound Scribbler™* holds a regular size crayon, a Number Two pencil, or a thin ink pen. When the user presses the writing or drawing implement on the paper, music and sounds are produced. When the user lifts the implement from the paper, the sound stops. This is a particularly useful device for students who need to apply more pressure when they write or draw. Only with adequate pressure does the user hear the auditory feedback. ►

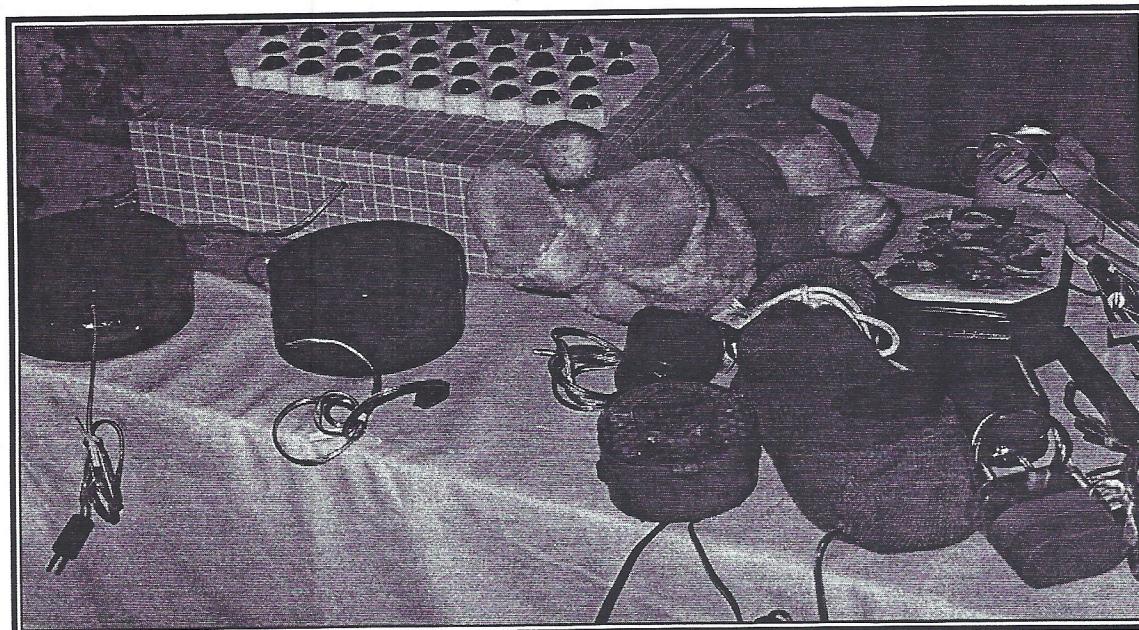
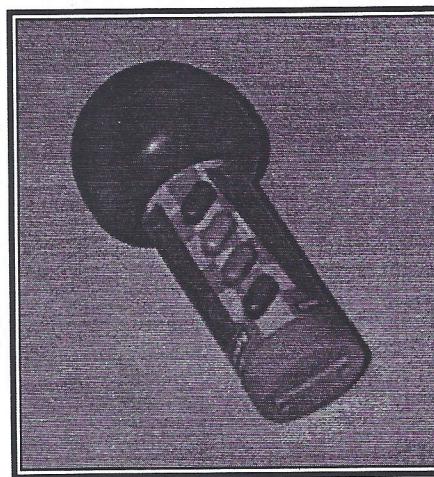


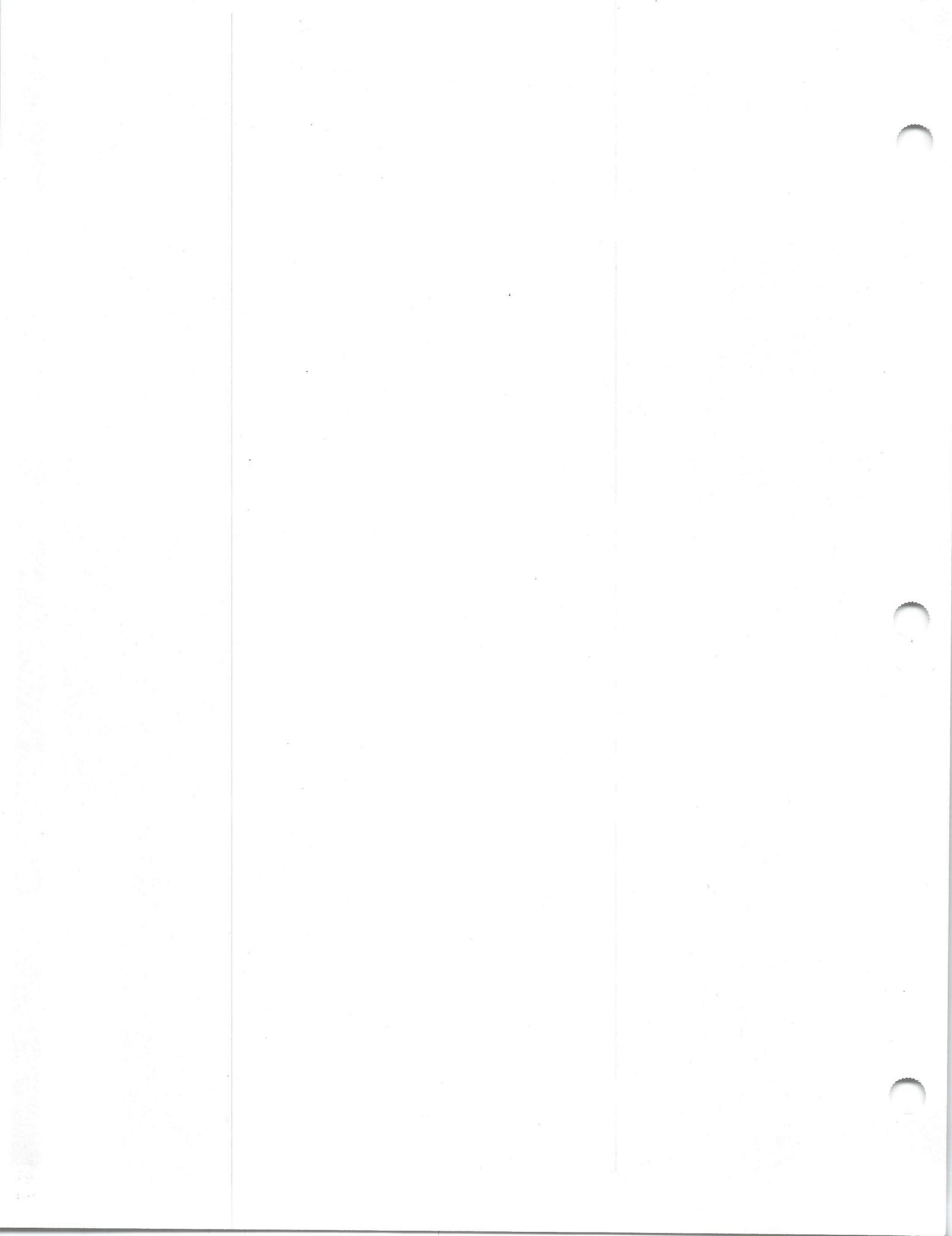
7. *VROOM™ Glove* — ◀ This toy contains a mercury switch mounted inside the plastic casing mounted on the knit glove. The glove stretches to fit most hands, but reattaching the plastic casing on a regular glove may make for a more comfortable fit.



When the user tips his/her hand forward, the sound emitted by the toy sounds like a motorcycle accelerating. When the hand is tipped backward, the sound emitted is a motorcycle braking. This toy may be helpful to use in training a user to appropriately activate a power wheelchair.

8. *Rockin' Pop™* — This toy has four easily depressed buttons that produce music and rhythms. Although the buttons are small, they are light-touch and can be adapted by adding small superballs or erasers to increase the size of the buttons. ►





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Faith Carlson, *PICSYMS, DON JOHNSTON, INC.*, P.O. Box 639, 1000 N. Rand Road, Bldg. 115, Wauconda, IL 60084-0639, (800) 999-4660.

Carol Goossens & Sharon Sapp Crain, *Utilizing Switch Interfaces with Children Who Are Severely Physically Challenged*, Pro-Ed, 8700 Shoal Creek Blvd., Austin, TX 78758

Ina J. Kirstein, *Oakland Schools Picture Dictionary*, *DON JOHNSTON, INC.*, P.O. Box 639, 1000 N. Rand Road, Bldg. 115, Wauconda, IL 60084-0639, (800) 999-4660.

Jackie Levin & Kathy Enselein, *Fun for Everyone*, Ablenet, Inc., 1081 Tenth Avenue S.E., Minneapolis, MN 55414-1312, (800) 322-0956.

Roxanna Mayer Johnson, *Picture Communication Symbols, Books I, II & III*, *MAYER JOHNSON COMPANY*, P.O. Box 1579, Solana Beach, CA 92075-1579, (619) 481-2489.

Christine Wright & Mari Nomura, *From Toys to Computers*, *DON JOHNSTON, INC.*, P.O. Box 639, 1000 N. Rand Road, Bldg. 115, Wauconda, IL 60084-0639, (800) 999-4660.

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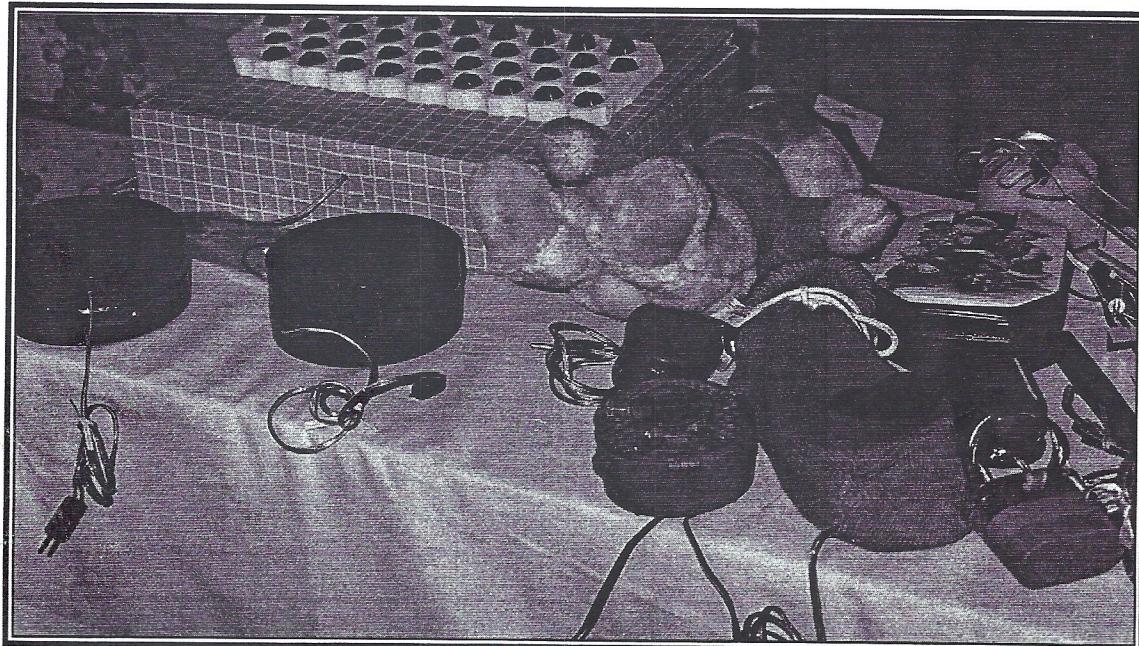
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About The Authors

Lynne A. Rocklage, Ph.D., Special Education

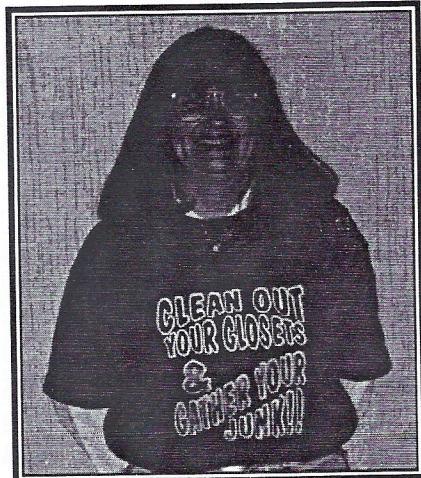
Lynne is an Associate Professor of Special Education at Eastern Michigan University in Ypsilanti, Michigan. She also serves as the Coordinator of Education and Service Activities for the Center for Adaptive Technology Education (CATE), in the Department of Special Education at Eastern Michigan University. In 1995, she was selected by the university community as the recipient of the Distinguished Faculty Award for Teaching Excellence. Lynne began her professional career as a Kindergarten teacher at Washington Elementary School in St. Louis, Missouri. She has served as the Handicap Coordinator for Shawnee Development Council Head Start Program in Karnak, Illinois, and she also served as an Assistant Professor in the Department of Special Education at Southern Illinois University, in Carbondale, Illinois.

Lynne served as the Administrative Director for the Brehm Preparatory School, a private boarding school for adolescents and young adults with learning disabilities, in Carbondale, Illinois. She was one of the founding directors of this school and its unique therapeutic educational program. Lynne was an Assistant Professor of Special Education at the University of North Dakota, in Grand Forks, North Dakota, where she developed and directed the Center for Teaching and Learning Integrated Preschool Program.

Lynne teaches courses in Assistive Technology in Special Education, and has taught courses in the areas of Learning Disabilities, and Early Childhood Special Education. She is a frequent presenter at local, state, regional and national conferences, and travels around the country providing workshops that focus on Low-End Technology.

Lynne is the "reported" team leader and organizer of this group of "Four Weird Women" and is known for her energy and enthusiasm in designing and creating adaptive access devices and strategies for persons with disabilities. To her close friends, family and colleagues, Lynne is known as the person you should always say "No" to...otherwise, she'll have you involved in another project, right up to your armpits!

Lynne is the mother of two grown sons, Chris and Matt, and the proud mother-in-law to Paula. Lynne and her significant other, Robert Stoneburner, happily reside and work together in Ypsilanti, Michigan.

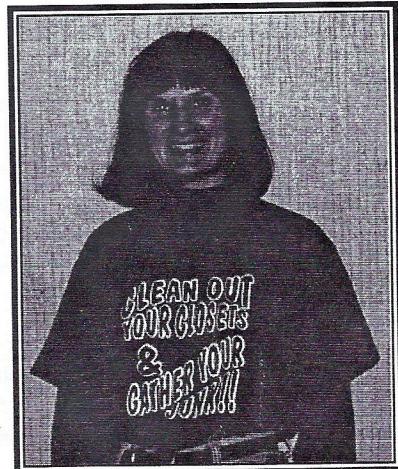


Lea Ann Peschong, M.S., SLP-CCC

Lea Ann is a Speech-Language Pathologist and Assistive Technology Coordinator for Area Education Agency #6, in Marshalltown, Iowa. Throughout her professional career, Lea Ann has worked as a Speech-Language Pathologist for the North Dakota School for the Blind in Grand Forks, North Dakota, and for the Center for Teaching and Learning Integrated Preschool Program at the University of North Dakota, Grand Forks. Prior to coming to North Dakota, Lea Ann served as a Speech-Language Pathologist for the Children's Care Hospital and School in Sioux Falls, South Dakota.

Lea Ann has co-instructed undergraduate and graduate level coursework in Assistive Technology in Special Education and has presented at regional, state, and national conferences. Lea Ann is known for her high energy level, creativity, and sense of humor. To her close friends and colleagues, she is best known as the woman who is willing to take anything apart, and push any button, just to see how it operates!

Lea Ann is married to Michael Peschong and has three wonderful children, Andrew, Tyler, and Nicole. Lea Ann and her family reside in Marshalltown, Iowa.



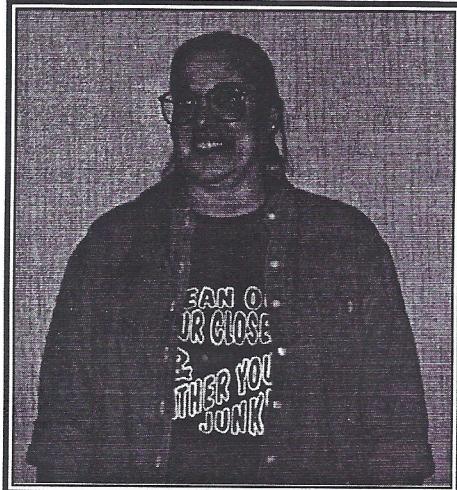
Amy L. Gillett, Ph.D., Special Education

Amy is an Associate Professor of Special Education at the University of Wisconsin – Stout, in Menomonie, Wisconsin. She also currently serves as the Program Director for the undergraduate program in Vocational Rehabilitation at the University of Wisconsin – Stout. In 1991 Amy was selected by her students and colleagues to receive the Outstanding Graduate Faculty Award. Amy has taught music at the elementary and secondary levels in south-central Minnesota and taught high school students with cognitive and learning disabilities at Waconia Senior High School in Waconia, Minnesota. Prior to moving to Wisconsin, Amy was an Assistant Professor of Special Education at the University of North Dakota in Grand Forks, North Dakota.

Amy has been actively involved in working with adults with disabilities and served as an Advocate for the We Unite group, sponsored through the Valley Chapter of the ARC. Her efforts and activities with We Unite, coupled with her teaching activities at the University of North Dakota, resulted in her achievement of the Educator of the Year Award from Valley Chapter of the ARC, as well as from the North Dakota State ARC.

Amy has co-taught courses in Assistive Technology in Special Education and has presented at regional and national conferences. Amy is best known for her consistent caring and concern and the stability she brings to any situation. Among her close friends and colleagues, Amy is known for her patience and consistency and always being the one who is willing to try for the "millionth" time to find a strategy that works!

Amy is married to Paul Keller. Amy and Paul commute between their two homes in Menomonie, Wisconsin, and Fergus Falls, Minnesota.



Barbara J. Delohery, M.Ed., Special Education

Barb is a Vision Consultant and Assistive Technology Specialist for the Grand Forks Public Schools in Grand Forks, North Dakota. Throughout her professional career, Barb has worked with students, from preschool through adult, who are multiply handicapped, visually impaired, and deaf/blind. She worked as a teacher for eleven years at the North Dakota State School for the Blind and for three years as an Outreach Provider delivering vision services to students with visual impairment throughout rural North Dakota. During her first two years with the Grand Forks Public Schools, Barb also taught Adaptive Physical Education. She has participated for six summers as a Sports Instructor at a summer camp program for adults with visual impairment.

Barb has co-taught courses in Assistive Technology in Special Education, as well as courses in Low Vision Assessment and Remediation, Preschool Assessment, and has supervised graduate practicum students in the areas of Early Childhood Special Education and Visual Impairment. Barb has presented at local, regional, state, and national conferences and is a frequent guest lecturer in graduate courses in Speech-Language Pathology at the University of North Dakota.

Barb is best known for her sense of humor and her never-ending energy and enthusiasm. She is the "creative shopper" of the group, always discovering new toys and items that can be used in innovative and unique ways. To her close friends and colleagues, Barb is best known as a very creative person, particularly when it comes to practical jokes and stunts. When she and Lea Ann are together, you never know what's going to happen next!

Barb is married to Michael Delohery and has three charming children, Chris, Katie, and Casey. Barb and her family reside in Grand Forks, North Dakota.

